THE METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS REVIEW, COPPER AND BRASS
A TRADE JOURNAL RELATING TO METALS AND ALLOYS

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PLANT OF MICHIGAN SMELTING & REFINING COMPANY, DETROIT, MICH.

DESCRIPTION OF THE DEVELOPMENT OF A NEW MODEL SMELTERY AND REFINERY IN THE MIDDLE WEST.

Ten years ago the general impression of a scrap-metal reducing plant embraced a few furnaces, molds and a pair of scales. Today this has been changed and the modern scrap-metal man and brass and composition ingot maker must have, in order to be in harmony with the times and public demand, as complete a plant as is required when the metals are first reduced from their natural ores. The smelting and refining plant here described and illustrated is as complete and modern as any we know of and certainly represents a high type of development. (Ed.)

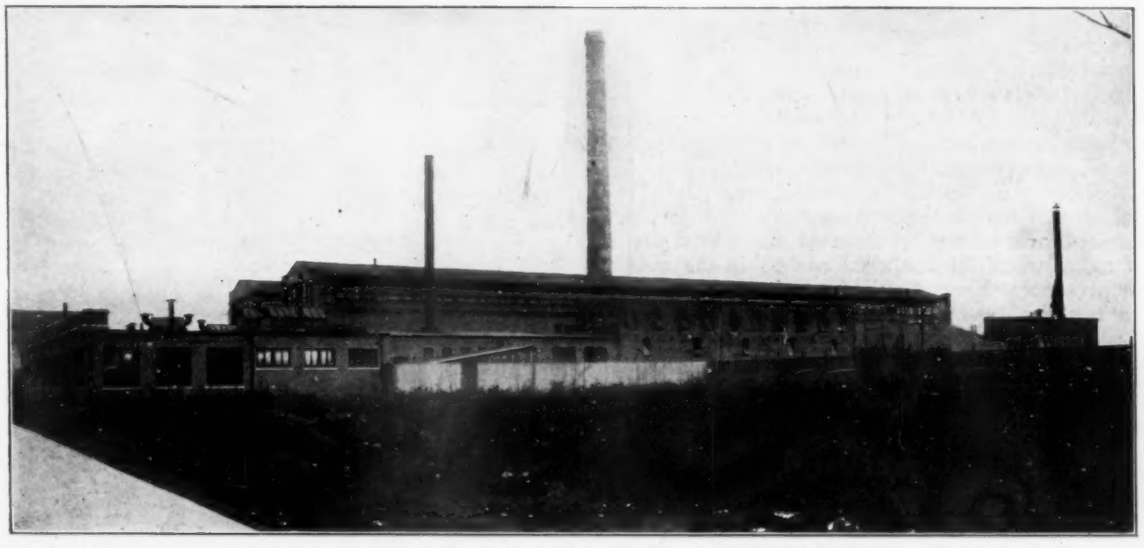


FIG. 1. BIRD'S-EYE VIEW OF PLANT OF MICHIGAN SMELTING AND REFINING COMPANY, DETROIT, MICH.

In any field of endeavor and achievement there is one pioneer and one only. Others follow, copy and build on the pioneer's work. Some years ago the Michigan Smelting & Refining Company, of Detroit, Mich., foresaw the great benefit that a first class composition ingot brass, whose composition, in its entirety, could be uniform and guaranteed within narrow limits, would be to the brass founder. By the aid of a well equipped laboratory the work of making a guaranteed composition ingot brass was commenced. They met with success from the start. A product was produced that met every requirement demanded, and the business grew so rapidly that they were compelled to seek a new location where better side track facilities could be had and where a larger plant could be erected to cope with the increased demands for their products. They moved into their new plant last May, and already they are cramped for room despite the fact that the plant has a total daily capacity of 200,000 lbs. of finished manufactured product. Already there are plans going forward for a general extension of both the main factory and the stock room and office section. A general view of the plant is seen in Fig. 1. It is 308 ft. long and 140 ft. wide.

An idea of the magnitude of the business can be gotten from Fig. 2 showing a section of the main office, which already is being overcrowded. The general manager's office is shown in Fig. 3.

The accomplishment of their aim to build up an enviable business in the high grade composition brass field would have been impossible without the assistance of a well equipped chemical laboratory where all compositions are controlled by modern rapid electrolytic processes. Most shipments of brass or white metal products are purchased on the analysis of the sample submitted and each shipment is again checked by the laboratory to see that it conforms with the sample analyzed. By so doing the element of chance or doubt is eliminated. One corner of the main laboratory is shown in Fig. 4. Two modern physical testing machines will soon be installed in order that tensile strength tests can be made on all metal daily, also compression and bearing metal tests.

The automobile industry has created a great demand for solder and babbitts. When it is known that every automobile or motor truck has on the average a great many pounds of solder and babbitt in its construction, is

it any wonder that, appreciating the number of automobiles and motor trucks that are turned out yearly, and the average life of a machine, that millions of pounds of both solder and babbitt are utilized? Fig. 5 shows a section of the solder and babbitt department where every modern equipment is used for turning out a large volume of products. Fourteen gas fired furnaces are in operation and water-cooled molds are used extensively. This department alone has a daily capacity of 35,000 lbs. All kinds of type metals and special solders are among the products produced in this department.

In this department all metals are prepared for the foundry. In addition to tons of ingot copper used in the brass composition, two large hydraulic briquetting presses, operating under a pressure of 3,000 lbs. to the square inch, are constantly at work putting rolling mill copper in its best condition for use in the guaranteed composition brasses. What more ideal conditions for foundry work can be had than those shown in Fig. 8. Abundance of light and good ventilation were constantly in mind in the planning of the buildings. Especially were these things necessary and now appreciated

SOME VIEWS OF THE MICHIGAN SMELTING & REFINING COMPANY'S PLANT AT DETROIT, MICH.

FIG. 2. SECTION OF MAIN OFFICE.

FIG. 3. GENERAL MANAGER'S OFFICE.

One whole section of the factory, 60 ft. by 250 ft., is used for a receiving and classifying room. This is shown in Fig. 6. Here is where all metals, except the ingot and pig metal, in their multiplicity of forms and compositions are carefully sorted and grouped in a way that will produce the best possible metal when melted. This is a slow process, many times, but nevertheless it is very essential. Such harmful metals as iron, aluminum and manganese bronze must be watched for constantly or tons of metal would be rendered useless in the melting by their presence. Every kind of non-ferrous metal and compositions can be found. The platinum tipped telephone contacts, the platinum of which is worth ap-

in the foundry. In all the melting equipment provision was made for burning both oil and coal or coke. In all the large refining furnaces, shown at the left in Fig. 8, a change from one kind of fuel to the other can be made in a very few hours' time. Therefore, no handicap of fuel shortage or mishaps in pumping or power equipment can put the furnaces out of commission. The excessive price asked for fuel oil at present has caused their forethought along this line to be keenly appreciated.

The sweating furnace, used primarily to remove impurities from white metals due to the difference in melting points, is seen at the extreme left in the picture.

FIG. 4. ONE CORNER OF THE MAIN CHEMICAL LABORATORY.

FIG. 12. PLATFORM FOR THE RECEIVING AND SHIPMENT OF METALS.

proximately $50 per ounce, the silver spoon and thimble, the virgin pure copper of highest conductivity, to the discarded unused brass castings, German silver, manganese bronze in many forms and the general conglomeration of brass and white metal scrap are there. Hand magnets, electro magnets and powerful magnetic separators are constantly in use to separate iron from the brass in its many forms. No iron can remain in the brass borings when all that is melted is passed over magnets having a lifting power of from 1,000 to 1,800 pounds. The group of magnetic separators is shown in Fig. 7.

Further down on the same side of the foundry are the twin white metal dross reducing furnaces. Beyond the dross reducing furnaces is the large copper and brass refining furnace. A close view of this furnace together with its ingot dipping and dumping equipment can be seen in Fig. 9. This furnace is capable of operation with both oil and coal and has a capacity of 15 tons daily. In this furnace all the number two compositions red brass

is made. It cannot be and is not a high grade composition because it is made from washings, skimmings, light brass and general brass refuse where excessive oxidation of metal has occurred. Even though the final product may approximate the composition of their high grade ingot brass it has not the life and strength and the superior casting qualifications that their brass has, containing a large percentage of pure virgin metals. Many ingot metal makers claim for a reverberatory product the same high qualities that this company's high grade brass contains, but it is a false assumption, and brass founders are finding it out more and more each day.

Each charge of metal is worked until the impurities are all removed beyond the detrimental limit, to the class of work on which the metal is used, and until the copper content approximates a certain definite composition. Then it is dipped out rapidly by means of two trolley ladles. A sample is taken from each round dipped out. The entire sample is then drilled and sent to the laboratory, where a complete analysis is made of each charge. Each charge is kept separate and sold on its analysis, thereby eliminating the element of chance to the customer, even on the second grade ingot. All of their high grade guaranteed composition ingot, made to any specifi-

FIG. 6. VIEW OF RECEIVING AND CLASSIFYING DEPARTMENT OF THE MICHIGAN SMELTING & REFINING COMPANY.

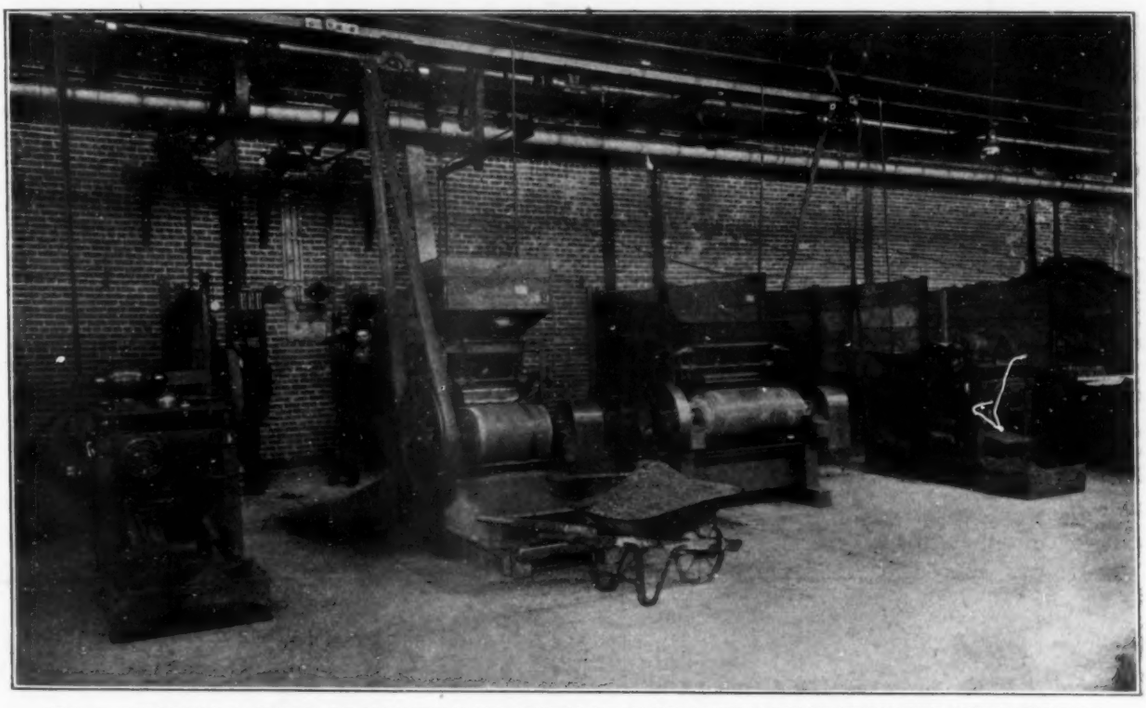


FIG. 7. SHOWING A GROUP OF MAGNETIC SEPARATORS FOR SEPARATING IRON FROM THE OTHER METALS.

cation, is crucible melted in the line of twenty furnaces seen at the right of the foundry. Large crucibles are used, giving the line of furnaces a capacity of about 50,000 lbs. daily. At the present time ten furnaces are operated with oil and ten with coke.

The metals coming from these furnaces is very uniform in composition and high grade. Only the best and purest metals are used. The laboratory receives a sample from every pot of metal that is melted. As a result, the mixtures are very closely controlled. On this grade of metal, not only the limits on one or two constituents are guaranteed, but all four are guaranteed within very narrow limits. In addition to this the upper limits of its impurities are guaranteed. In this class of metal 50 per cent. at the least of virgin new metal is used to give it the best casting and machining qualities. The addition of these virgin metals is very essential and it is a practice strictly adhered to in this foundry. Even though brass turnings could be gotten having a copper content high enough to furnish the necessary amount of copper for a given high grade composition brass, they are never used to such an extent. The resultant metal would lack the quality that virgin metals add to a mixture. Some ingot manufacturers have contended that copper is copper and tin is tin and is equally good wherever found, and that any mixture containing a certain amount of copper by analysis, no matter where the copper came from, is as good as any other mixture of the same composition made from pure metals.

This business was never built up on such a false assumption. Copper and tin, or any other metal as far as that goes in the abstract, may be as much different from

FIG. 8. VIEW OF GENERAL FOUNDRY SHOWING SWEATING AND REFINING FURNACES, WITH INGOT DIPPING AND DUMPING APPARATUS.

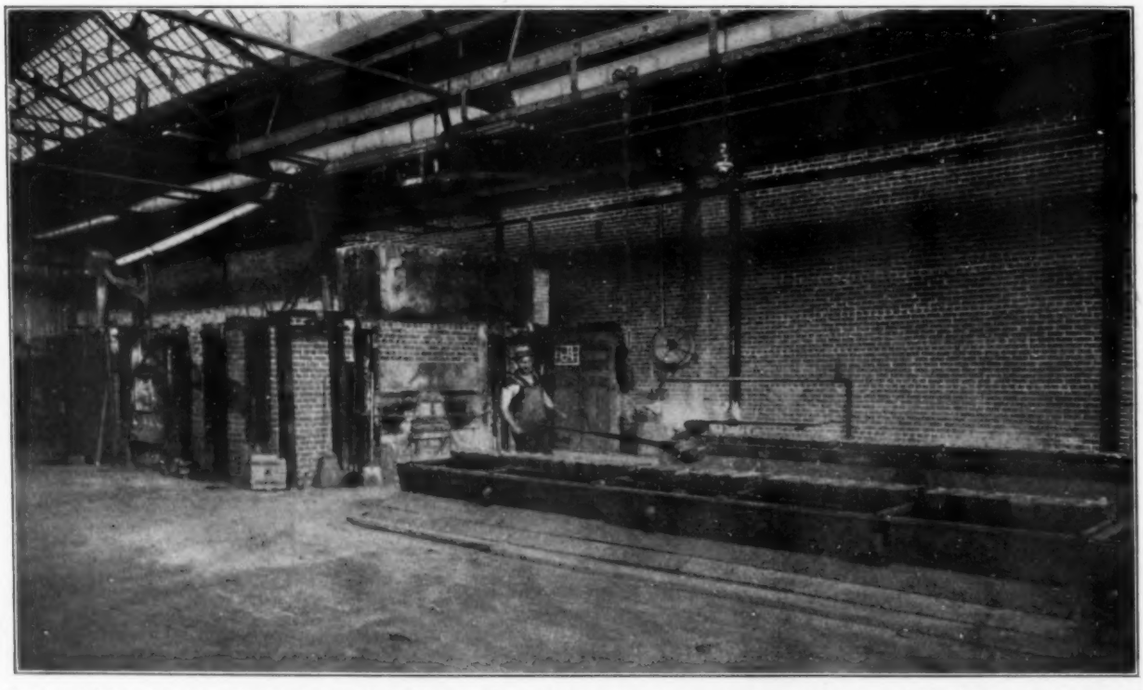


FIG. 9. LARGE BRASS AND COPPER REFINING FURNACE WITH A CAPACITY OF 15 TONS DAILY, BOTH COAL AND OIL CAN BE USED. MICHIGAN SMELTING & REFINING COMPANY, DETROIT, MICH.

other copper or tin, as certified milk may be different from ordinary milk, or as one fuel oil may be different from any other fuel oil. Milk is milk and oil is oil, but there is a vast difference in their comparative quality and value. Likewise copper is copper and tin is tin, but whether partially pure or alloyed with other metals, there may be a great difference in their action on a brass composition. It is for this reason that a reverberatory furnace ingot, made from the refuse that it is made from, is far inferior to their high grade guaranteed compositions even though the reverberatory ingot may have the same analysis as the other ingot. The company manufactures several well known standard compositions, besides dozens of special compositions that are needed for special work.*

In the foundry are located two large white metal stock kettles where miscellaneous lead, solder and babbitt scrap are melted and partially cleaned in readiness for the sweating furnace or white lead department. Zinc is also melted and cleaned in two five ton kettles located in a room directly off the foundry so that the poisonous fumes are conducted in an underground flue to the main stack which is 125 ft. high and 5 ft. inside diameter. This stack is of reinforced concrete and lined entirely with fire brick. The cupola used in conjunction with the reverberatory is of the usual construction, but several new features are in use in its operation.

The Michigan Smelting & Refining Company has recently entered the lead pipe field and has installed a No. 1 hydraulic press. All standard sizes and weights of lead and tin pipe are made and also some lead and special strip solders. From six to eight strands of solder wire are also produced by this press at one time. A view of this machine making wire solder together with its hydraulic pump and motor is shown in Fig. 10.

The stock room where all new metals as well as all composition metals are kept is shown in Fig. 11. Hundreds of tons of new metals, such as copper, tin, lead, zinc, aluminum, antimony, phosphor copper, etc., as well as large supplies of composition ingot, are always kept in stock ready for prompt shipment upon request. Much carload business is transacted, and it is not an uncommon thing to receive from six to ten carloads of material in one day. The unloading and shipping platform, which is 270 ft. long, and the siding for the receiving and shipment of metals, is shown in Fig. 12. Another siding for fuel and factory supplies is located on the other side of the factory. Nearly all the local deliveries are made by automobile trucks owned by the company. Two heavy duty Packard trucks and one and one-half ton electric truck are overtaxed each day and an addition of another 5-ton truck will soon be made.

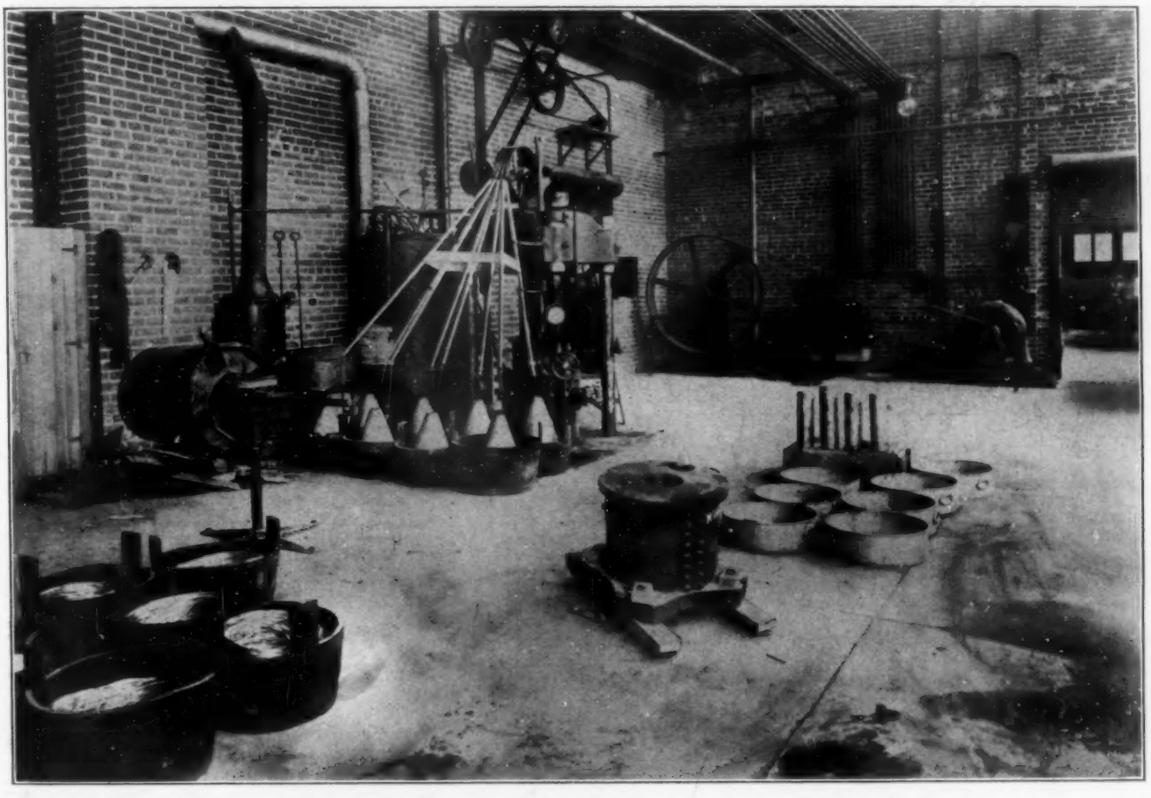


FIG. 10. A VIEW OF THE SOLDER WIRE MAKING MACHINE SHOWING HYDRAULIC PUMP AND MOTOR.

Continued progress and success are inevitable to a company like the Michigan Smelting & Refining Company, which has spared neither thought nor money to produce a uniform, guaranteed, high quality composition and thereby gain a worthy reputation in their pioneer work. All of the building is very light, well ventilated, steam heated and modern equipment and machinery has been installed. In fact it has the necessary laboratory equipment, the necessary expert chemists, the necessary producing equipment and a vast fund of data and experience with which to make composition brass of the highest quality, and one that will meet requirements and rigid specifications necessary in the field of keen competition for the brass founder.

*One noteworthy thing in connection with the pouring of the composition ingot is the continuous conveyor seen in the center of the foundry. It is a great labor-saving device and possesses many original features. It was designed by Albert J. Hall, operating manager.

INTERESTING VIEWS IN THE PLANT OF THE MICHIGAN SMELTING & REFINING COMPANY, DETROIT, MICH.

FIG. 5. SOLDER AND BABBITT DEPARTMENT CONTAINING EVERY MODERN EQUIPMENT FOR TURNING OUT 35,000 POUNDS OF METAL PER DAY.

FIG. 11. GENERAL STOCK ROOM, WHERE ALL NEW AND COMPOSITION METALS ARE KEPT READY FOR IMMEDIATE SHIPMENT.

A NEW FACTOR IN METAL FAILURES

By Ernest A. Lewis.

It has always been assumed that when copper, tin, zinc and lead are alloyed together by melting that only complicated chemical means could separate them. This is now known to be a delusion; they can be separated by physical means. Professor Turner in the course of his experiments on heating alloys in a vacuum found he could separate copper and tin from lead and zinc at a red heat. This is rather a difficult process, although it will very probably be worked commercially eventually. The Mond process of making nickel is a great success and the apparatus is far more complicated than the vacuum process would need. The writer has learned by experiment that in an atmosphere of hydrogen, zinc and lead can be separated from copper and tin at a red heat, considerably below the melting point, but not so well as in a vacuum. There is always 3 per cent. or 4 per cent. of zinc left in. The importance of this fact in the metal rolling business will be appreciated, when it is seen that hydrogen is a reducing gas. Further than this, in coal gas also, there is volatilization of zinc, but not so much as in hydrogen. Carbon dioxide is apparently an inert gas, as I have heated brass in a current of it and no volatilization takes place. It must be understood that there is very little chance of injuring copper by annealing in steam.

Many manufacturers have found remarkable red places on the surface of brass sheets after they have been annealed and pickled. Various suggestions as to the cause of this have been brought forward. An old suggestion was, that it was due to sulphur in the coal. Why this should be I do not know, as the iron pyrites in coal burns to sulphur dioxide and it is hardly possible this would affect the color; another suggestion and in some cases it is quite true, is, that it is due to iron in the pickling baths, but these peculiar marks come when there is no iron. They are quite different to the red tint obtained when brass and copper are pickled together. This bad practice is occasionally done. The probable cause of the red patches is that a reducing atmosphere has been formed in the annealing furnace, long enough to volatilize the zinc on the surface and leave the copper behind. Incidentally the experiments showed that although brass may contain traces of oxide it is not an essential constituent like it is of copper. In every case the turnings or sheet were perfectly soft and there was no sign of brittleness. Everyone who has heated copper in such a way as to reduce the oxide in it knows how brittle it becomes, because the oxide of copper is an essential constituent of practically all commercial coppers.

In locomotive type of boilers, which have brass tubes, it has often been noticed that the ends near the fire are corroded away. It is usually assumed that chloride in the coal is the cause of this, but it seems to me that it is far more complicated. A reducing atmosphere may be formed and this would favor volatilization of zinc and this, in conjunction with chlorides and sulphur, would cause rapid deterioration. The alteration of surface composition in yellow metal sheets for sheathing would favor corrosion in sea water. This alteration cannot be due to bad mixing of the metal at the time of manufacture, as has been suggested, but if the zinc can volatilize under certain conditions of manufacture, it would account for some cases of corrosion in patches.

The only satisfactory way to anneal brass is in furnaces where the flame does not touch it. It has been urged by manufacturers as an amelioration of the offence of pouring black smoke into the atmosphere, that it is necessary to anneal brass under such conditions. There is no necessity at all for such conditions; in fact, the reverse is the case, long "soakings" are found to be unnecessary.

FIG. 13. SHOWING BRASS MELTING FURNACES IN THE PLANT OF MICHIGAN SMELTING AND REFINING COMPANY, DETROIT, MICH. THERE ARE TWENTY OF THEM WITH A DAILY CAPACITY OF 50,000 POUNDS.

CONDITION OF THE ALUMINUM INDUSTRY

THE LATEST DEVELOPMENTS IN THIS IMPORTANT BRANCH OF THE METAL ARTS.

BY SPECIAL CORRESPONDENT.

The aluminum industry has been brought before the public eye during the past year to a greater extent than hitherto owing to the fact that the Aluminum Company of America has been the object of investigation by the Department of Justice. The metal industry, along with the other friends of this company, has been gratified to note that this investigation failed to reveal any abuse of the monopoly of the manufacture of aluminum enjoyed by the Aluminum Company of America in the United States. It is reported that competition is about to arise, however, in the Southern Aluminum Company, which is engaged in preparations to manufacture aluminum with electric power secured from the Yadkin river at Whitney, North Carolina. The projected size of this new aluminum company and the fact that the importation of foreign aluminum is being stimulated by a keen demand assures to the aluminum consumers of the United States a sufficient source of supply of the metal to remove any possible embarrassment which might arise due to dependence upon a single source of supply.

During the latter part of 1912 the aluminum market was brisk, as was true of all other metals, and the demand has recently exceeded the supply not only in the States but equally so in Europe. The inconvenience to consumers which would naturally arise under such a condition has been considerably hastened and augmented by the metal brokers here and abroad who have contracted ahead during the past year for large quantities of aluminum for the purpose of doling it out at prices considerably in advance of those at which they purchased. A general slackening in the trade during December, however, will discourage speculation of this sort and encourage those who are in touch with the situation to believe that the embarrassment which the consumers have lately experienced will not continue during the year 1913.

The Aluminum Company of America has been endeavoring for some time past to increase its production capacity, but has been confronted with difficulties in securing adequate source of supply of electric power. Most of the water power developments which are sufficiently large to meet the requirements of this company are subject to some sort of governmental control, and the Government seems inclined to misinterpret the commendable policy of reasonable conservation into one of entire prohibition of development of any sort, a practice that might not improperly be characterized as miserly and one which certainly is working a hardship on the entire electro-chemical industry of the country and on all whose needs are served by this rapidly growing industry. The Aluminum Company has been fortunate, however, in securing the certain riparian rights located in North Carolina and Tennessee. Its plans contemplate the development of this water power on the most economical basis for use in a large aluminum plant to be constructed at once at such nearby point as will afford good freight rates and labor market. Until its own power development is completed the company will use power supplied by the Tennessee Power Company from their development on the Ocoee river near Chattanooga, Tennessee. This new aluminum plant

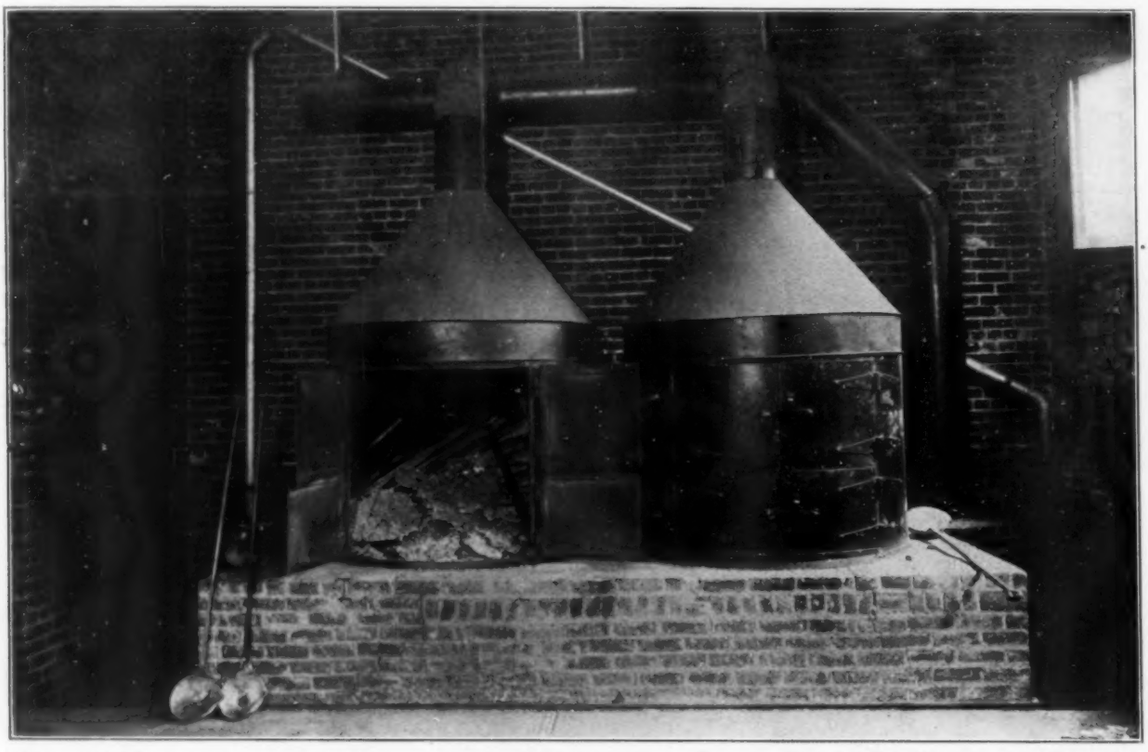


FIG. 14. VIEW OF THE ZINC FURNACES. HERE THE ZINC SCRAP IS MELTED DOWN AND REFINED AT THE PLANT OF THE MICHIGAN SMELTING & REFINING COMPANY, DETROIT, MICH.

will be in operation by the middle or latter part of the present year.

In addition to its extensions in the South the Aluminum Company is working on an extension to its Massena, New York, plant which, when completed in 1914, will give that plant the distinction of being the largest aluminum production works in the world. It is also stated that a large supply of electricity will be brought to Massena from the development on the St. Lawrence at Cedar Rapids. A part of this extension will be in operation in 1913 and the entire extension will be completed in 1914.

An entirely new branch of the industry in which the Aluminum Company has lately embarked is the manufacture of powdered aluminum known to the trade as aluminum bronze powder and employed widely as a paint pigment, in explosives and also in lithographing and printing. The experimental plant located at Dover, New Jersey, having proved quite successful, has been moved to new quarters at New Kensington, Pennsylvania, where the company now has in operation one of the most complete aluminum bronze plants in the world.

Other enlargements have been made at the New Kensington works: notably the construction of a plant for the manufacture of tanks, cooking vats and similar vessels which, made of aluminum, are finding high favor among brewers, preserve manufacturers and all industries where its heat-conducting, non-corrosive and non-poisonous qualities recommend aluminum. A considerable extension has been made to the cooking utensil factory located at this point, and a thoroughly modern boiler house is also being installed. In line with the usual progressive policy of the Aluminum Company of America, the company also plans a construction of an elaborate building for the convenience and comfort of its employees, in which will be a lunch room, bathing facilities and numerous other conveniences.

The most notable growth in the aluminum industry during the past year has been in extruded forms, tubing and aluminum foil. The many difficulties which attended the early efforts at extrusion have practically all been mastered and it is now possible to supply extruded aluminum of high tensile strength and very compact structure in practically any form desired. The use of aluminum tubing has also been growing, so much so, in fact, that the Aluminum Company is planning a considerable extension to its tubing plant at New Kensington.

The manufacture of aluminum foil is not a new application of aluminum by any means, but this use has always been limited owing to the high cost of the foil. Improved methods, however, have permitted a considerable reduction in price of aluminum foil and its use is now being pushed in several lines from which it was hitherto barred by its high cost. It is being largely employed in the manufacture of electrical condensers and for wrapping tobacco, candy and various food products where heretofore tin foil has been used. The Aluminum Company of America already has under way the construction of the largest aluminum foil factory in the world.

The Aluminum Company of America has been the world's pioneer in the manufacture of electrical conductors and in harmony with its forehandedness in this respect is now recommending an aluminum cable, steel reinforced, which consists of a seven-stranded cable—the six outer strands being of aluminum and the centre strand being of a steel of very high strength. It is claimed for this conductor that it possesses the highest qualities for transmitting electric current, and in addition has a strength which renders it particularly suitable in tower construction which is now almost entirely replacing pole construction of transmission lines. The Pacific Light & Power Company of Los Angeles, California, have adopted this cable for their new transmission line which is to be the longest in the world. It will carry electric power into Los Angeles from a power station located 275 miles distant. The Pacific Light & Power Company adopted this new aluminum cable, steel reinforced, only after having investigated all other conductors very carefully.

IMPROVING THE QUALITY OF ALUMINUM.

Aluminum is a very useful metal, although it is so comparatively new to us; but like other metals is has its faults, which we seek to neutralize by alloying it with other materials, since the action of heat upon it does not affect any desirable changes therein, as is the case with steel.

Among the experiments that have been made in the way of alloying are those with cobalt, the results of which have not become very generally known, and which are especially interesting when the action of this alloy is increased by the addition of tungsten and molybdenum.

Scientific researches into the chemical relation of aluminum and cobalt in alloy form go to show that those two metals are so to say soluble in each other. Of the various alloys that have been made and studied, the one with the least percentage of cobalt had ⅓ of this metal therein; its solidifying point being somewhat above 100 degs. C. Between this compound and aluminum there is a "eutechtic" containing only 0.5 per cent. of cobalt, and having a melting point lower than that of pure aluminum. There is also in the curve showing the melting points of the aluminum-cobalt alloys, a decided kink at the point corresponding to 20 per cent. of cobalt.

With 9 to 12 per cent. of cobalt there are obtained alloys that are almost free from bubbles, although the fracture is somewhat coarse and crystalline; and although the tensile strength is not much above that of pure aluminum the alloy is more readily turned and polished, etc., and much more resistant to atmospheric influences. These alloys are still quite light and much more workable than pure aluminum. The lack of tensile strength is due to the coarse crystalline fracture, but this may be improved by the addition of tungsten (which the Germans call "wolfram") and molybdenum, so that by the help of these an alloy with but a small percentage of cobalt has three times the tensile strength of aluminum, and is also malleable and ductile. These alloys run about 0.8 to 1.2 per cent. tungsten, 8 to 10 per cent. cobalt, the rest aluminum.

The more cobalt these alloys contain, the less readily can they be rolled, but the greater their tensile strength; so that those with high cobalt percentage are better for castings, the poorer ones better for forging and rolling. The alloys of molybdenum, cobalt and aluminum run from 0.6 to 1 per cent. molybdenum, 9 to 10 per cent. cobalt, the rest aluminum; these follow about the same general rules as those of wolfram, cobalt and aluminum, except in the matter of hardness, in which they are inferior to the corresponding tungsten-cobalt alloys.

ROBERT GRIMSHAW.

NEW FRENCH NICKEL WORKS.

In conjunction with the new nickel coinage destined to replace the bronze currency in France a group of French capitalists has formed a nickel-working company in Belgium with $800,000 capital, to be known as the Société des Usines de Nickel de la Nethel.

HINTS ON BRASS FOUNDING

W. R. DEAN.*

(Continued from May, 1912.)

ANTIFRICTION METALS AND GERMAN SILVER.

Of the antifriction alloys, the most common is known as babbitt, used mainly to babbitt places where friction occurs. The commonest babbitt is lead 4½ parts and antimony 1. A better grade has tin in it; lead 20, tin 1, and antimony 4. From these we go to the white brasses, which are friction alloys, but stiffer in composition, having copper added. A good white brass is copper 6, zinc 92, and tin 196. These alloys are usually out of the line of the general brass founder and are made by specialists. German silver is used mainly for silver work, it being the foundation for plated ware. It is also used for saddlery hardware, and with a variation of the proportion of the metals used, sometimes for plumbers' supplies, known then usually as Benedict metal, and corresponding with white metal tubing and pipeing put out by Benedict. The proportions vary considerably, but usually the nickel is from 15 per cent. to 25 per cent. with copper, zinc, lead and tin, the lead about 10 per cent., zinc 15 per cent. to 20 per cent., and 4 or 8 per cent. of copper for the balance.

German silvers are hard metals to melt on account of the high melting point of nickel. The nickel is usually melted first under magnesium, and then copper and other things added.

Now that a general idea has been given of the alloys, etc., so that with a little thought one can make an alloy for individual needs, we will pass on to the furnaces for melting, and then to a general plan of arranging the foundry for economical production.

FURNACES.

The type and style of furnaces are many, as shown by the article on furnaces in THE METAL INDUSTRY, 1910-1911, but most of the large brass foundries retain the old style coke or coal-burning pit furnace for some classes of work. The newer foundries have oil or gas-burning furnaces, of the stationary or tilting kind. While a few tried the tilting hot blast coke style. The type to be used depends greatly on the class of work and metal. In a small foundry of under a dozen molders, the pit style is really the best; they are less costly to install, and if the stack is built right for a good draft, are about as economical with coke as the other styles. Oil or gas furnaces can be employed successfully in any size foundry, but are more expensive to install; and unless one is near the oil or gas wells are fairly expensive to run, as oil costs quite a bit away from the wells. A good natural draft and coke make a fairly economical combination.

The style known as tilting where the crucible remains in the furnace necessitates a ladle heater and does not give as good metal in yellow brass, high in zinc, or in the copper tin alloys on account of the oxidation due to the metal being poured twice. When the style with the removable crucible is used, usually more furnaces are required as crucibles ranging from

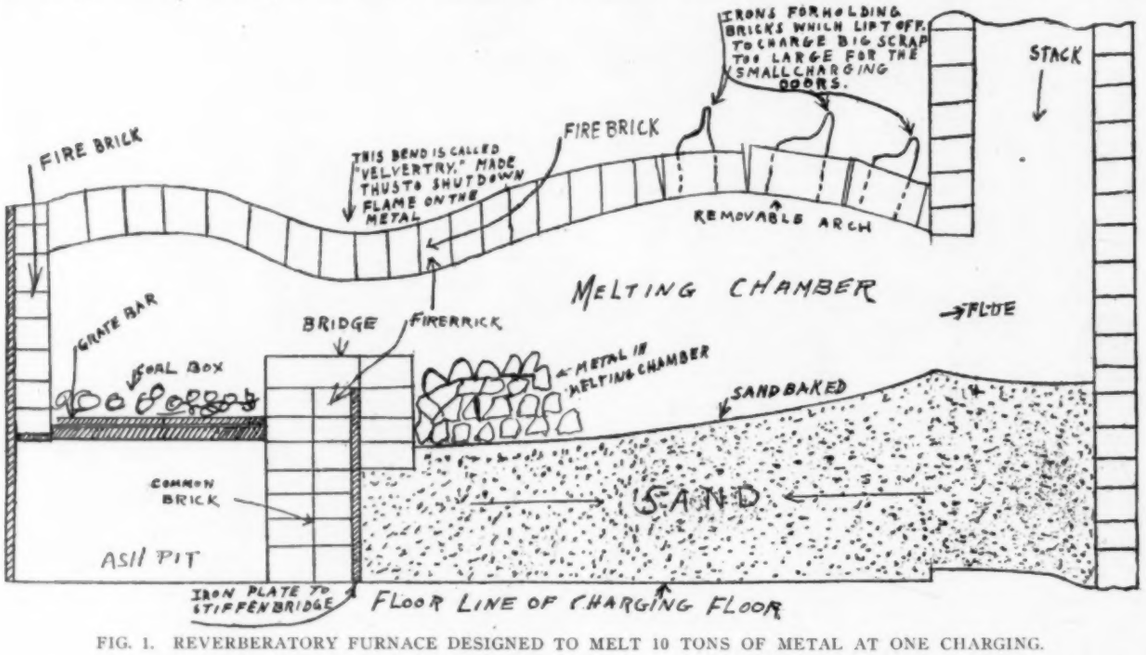


FIG. 1. REVERBERATORY FURNACE DESIGNED TO MELT 10 TONS OF METAL AT ONE CHARGING.

30 or 35 to 300 are used, while with the tilting kind a size using a crucible taking 500 pounds of metal is the most common and convenient size. With this style a No. 18 crucible can be used as a single hand for pouring, and a flask at a time poured giving excellent results by constantly furnishing hot metal. With the bull ladle, especially with manganese bronze, besides the double pouring, cooling the metal, the slow pouring also aids in cooling and is not as steady. With the single hand each flask has hot metal or metal hot enough to give a good casting. With very thin castings of manganese bronze weighing anywhere from 15 to 150 pounds this style furnace is successful, as just enough metal can be taken to pour the casting, while with the removable kind either a lot of furnaces are necessary or else the castings would have to be thicker; as trying to pour several castings from one pot would give castings not properly filled out.

Another style of furnace is the direct flame kind,

*Foundry Foreman, Hyde Windlass Company, Bath, Me.

burning oil or gas, and the flame passing directly over the metal. In this style it is necessary to have a good reducing flame and keep the chamber well filled, or oxidation takes place and ruins the metal. A heat of metal in this style has to be melted quickly to get the best results, 15 or 20 minutes being sufficient for 500 pounds. This style also calls for a ladle heater. This kind of a furnace can be purchased to take large heats up to 10 tons or larger if necessary. The old reverberatory furnace, or air furnace, is used in one shop for melting heats of 2,000 pounds or more, coal being the fuel. In this style the flame passes over the metal, being known as the direct flame type. The coal burns in a separate chamber and the roof has what is known as a velvetry to throw the flame down. This style is economical on large heats, as the furnace does not take up a great deal of room compared with the other styles melting the same amount. The furnace I refer to is designed for 10 tons. Fig. 1 shows a section of the air furnace.

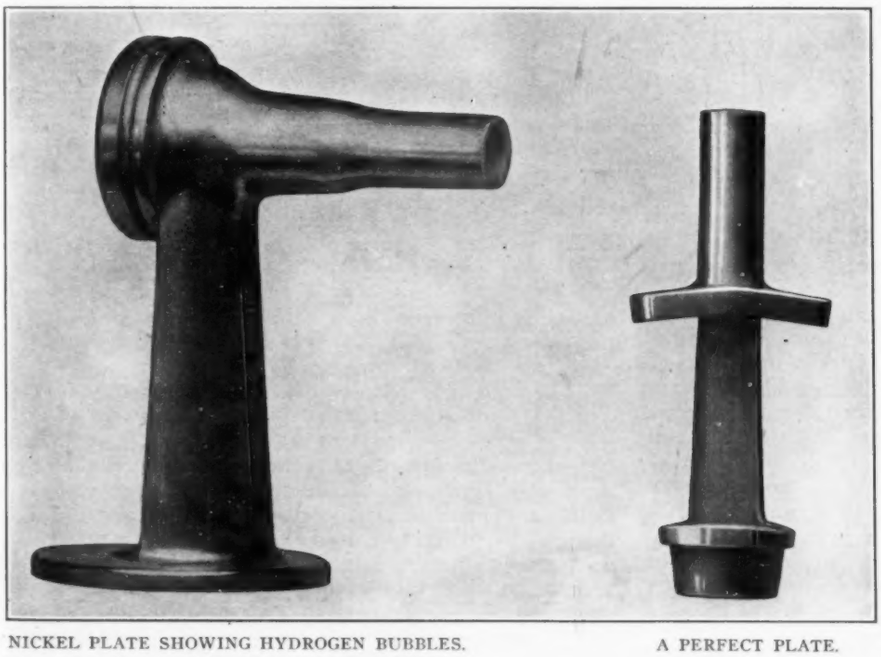
In some oil furnaces the oil is supplied under high pressure, 16 to 18 pounds being generally used and a noise is the result. There is one style just placed on the market during the last two years, using only one to two pounds pressure and is noiseless. This style has the reducing flame entirely. The high pressure burner is apt to gave an oxidizing flame if great care in adjusting it is not used. There are two styles of coke furnaces on the market, burning coke under forced draft, one is American built, the other English. The main trouble with these is the labor expense on account of coking; one man cannot run as many furnaces, as he is constantly coking. Seven heats out of one, or eight heats out of two is about the limit for one man. The crucible expense is great in the English furnace, the crucible holds about 400 pounds and costs about $23 and lasts with new metal for about 50 heats. A complete description of American melting furnaces was published in THE METAL INDUSTRY, August, September, October, November, December, 1909, and February, 1910. English melting furnaces were treated in July, 1910.

(To be continued.)

A PRACTICAL NICKEL SOLUTION FOR PLATING DIE CASTINGS

By CHARLES H. PROCTOR.

One of the important developments in recent years in the production of metal goods is what is known as die castings. These castings are produced by forcing the molten metal under pressure into molds, and are made in all varieties of shapes and sizes. Their uses are largely in small automatic machinery, typewriters and coin operated vending machines, or wherever cast parts can be used that do not require the tensile strength of brass or bronze. The advantage gained is a nearly perfect machined finished casting, that requires very little labor to produce a surface ready for the plating operations. The composition of die castings largely used consists of zinc, 85 parts; copper, 10 parts, and tin, 5 parts. Owing to the high percentage of zinc used, considerable difficulty has been experienced by many platers in producing a successful nickel deposit on these castings. It is the intention of the writer of this article to explain some of the difficulties experienced with the regular nickel solutions in vogue, when plating die castings, and also the formula used that apparently overcomes these obstacles and produces a satisfactory deposit with no more trouble than would be experienced in the nickel plating of an ordinary article made from brass, bronze or steel.



NICKEL PLATE SHOWING HYDROGEN BUBBLES. A PERFECT PLATE.

In nickel plating zinc castings, or those containing a high percentage of zinc, in the ordinary nickel bath, consisting of the double and single nickel salts and other combinations used as conducting salts, unless the castings become at once coated with a uniform deposit, black streaks appear on the surface. If the articles contain depressions, a high amperage must necessarily be used and such a high current frequently causes burning of the deposit, which causes considerable trouble in the final polishing. Peeling of the deposit also frequently takes place, due to the formation of the black streaks mentioned above. These black streaks are due to the electro-positive nature of zinc, which sets up a counter current in a nickel solution, causing a reduction of the metal. For this reason, as stated, it is necessary that the surface should be immediately covered with a film of nickel to prevent this local action. To overcome the difficulty noted the zinc castings very often are previously coated with copper in an alkaline copper bath. This apparently overcomes the difficulty resulting from black streaks but it often develops another trouble, which proves more serious than the first. This latter difficulty generally does not develop for one or two days after the castings have been plated and finished and then hundreds of min-

ute blisters will appear upon the finished surface, and if these are broken, it will be found that the deposit is completely lifted from the surface.

This proves to be a puzzling phenomenon to the plater who thinks of everything excepting the correct cause of the trouble. The cleaning operations are gone over, the bath is frequently doctored, the castings are boiled out for long and short periods, the current is increased and decreased, and still these dreaded blisters appear. Occasionally the plater realizes the cause of the trouble. It is well known that when copper and zinc are immersed in a dilute acid solution an electrical action is developed, producing a positive and negative current. The positive develops oxygen; the negative, hydrogen. This is exactly what occurs when copper-coated zinc articles are plated in a nickel bath, which is slightly acid. By local action hydrogen is developed at the surface of the zinc and being coated with the film of copper, becomes occluded or shut up. Then the nickel coats over the copper and the hydrogen becomes more imprisoned. The articles are finally removed from the bath and are washed and boiled out.

Now hydrogen expands under the influence of the heat of the boiling water and at the same time the nickel and zinc expand but with an unequal expansion. The expansion of the hydrogen gas lifts the nickel from the coppered zinc surface because the development of the hydrogen on the surface of the zinc has prevented the true adhesion of the copper and consequently the nickel to the zinc. It might be inferred that the development of the hydrogen could not take place from the action of the nickel solution, but when we take into consideration that every electro-deposit is built up from infinitesimal particles of metal which are very porous, it can be readily seen that with a thin coating of copper, such as may be applied to zinc castings before nickeling, the gases forming on the copper could readily penetrate the thin deposit of copper and enable the action of the solution to take place upon the zinc, producing the development of hydrogen as noted.

Now, when such articles are removed from the boiling water, the blisters do not appear to develop at once, but as the castings become quite cool and contraction of the metals occur the blisters will first be noted as fine as a needle point and gradually become larger, as shown in cut, especially so, after the final polishing of the articles, or the nickel will peel in spots as the casting becomes warm from the friction of the buff wheel. This, then, is the true cause of the blistering of die castings, when made from the composition previously noted.

The writer has made numerous experiments in an endeavor to produce a simple solution that would overcome the difficulties noted, so that the deposit could be applied directly to the zinc castings without any more trouble than with a sheet metal article of brass or similar metal. In preparing such castings for plating the usual methods were followed: cutting with tripoli to a smooth surface without further coloring, washing in benzine and cleansing in Kayle solution, washing and immersing in the cyanide dip and then rewashing and immersing directly in the nickel bath. The formula which proved eminently satisfactory consists of the following:

Nickel ammonium sulphate	8 ozs.
Sulphate or magnesium	2 ozs.
Water	1 gal.

The solution is used cold and deposits readily at two volts pressure. The anodes, used in my experiments, were cast nickel and cold rolled steel. The steel anodes reduced perfectly in the solution and a deposit of pure silvery white nickel, which was of sufficient thickness for all ordinary purposes, was produced in from twenty to thirty minutes. After several months the deposit shows no signs of hydrogen blisters and is perfectly adherent and homogenous. Articles made from zinc, such as die castings, and plated in the regular nickel solutions, which developed intense black streaks, were readily re-plated in this solution, without repolishing, and show no more defects than the castings which were plated direct in the solution mentioned.

I believe that the addition of sulphate of magnesium to nickel baths of various compositions will prove more satisfactory as a conducting salt than the ammonium or chloride combinations, and that concentrated solutions can be produced that will deposit rapidly by using the single sulphate of nickel and magnesium sulphate, with probably grape sugar or some such organic matter that will enable the plater to use a greatly increased amperage upon his work; thereby reducing the time of deposit considerably without any additional cost of labor or material, other than is required to produce the increased density of the solution to produce the results mentioned.

HIGHER DUTY ON BRASS WIRE.

The Treasury Department at Washington, D. C., has issued an important decision in the matter of the customs classification of brass wire, authorizing a change from the present practice. A letter to the collector at New York, outlining this decision, says:

"It appears that at some ports it is the practice to assess duty upon merchandise of this character under paragraph 135 of the tariff act at the rate of 35 per cent. ad valorem and 1 cent per pound, while at one port it is the practice to assess duty upon articles in chief value of brass wire at 45 per cent. ad valorem under paragraph 199, plus 1 cent per pound under paragraph 135 of the said act.

"Paragraph 135 does not provide specifically a rate of duty upon brass wire, but merely provides that such wire shall not pay less than 35 per cent. ad valorem, and, following the decision of the Board of United States General Appraisers, the department is of the opinion that articles manufactured in chief value of brass wire are properly dutiable under paragraph 199 of the tariff act at the rate of 45 per cent. ad valorem.

"The department also concurs in the practice of assessing duty upon these articles at the rate of 1 cent per pound under paragraph 135, in addition to the rate of 45 per cent. ad valorem.

"The second proviso to paragraph 135 requires that articles manufactured wholly or in chief value of any wire or wires 'provided for in this paragraph' shall pay the maximum rate of duty imposed in the tariff act upon any wire used in the manufacture of such articles, and in addition thereto 1 cent per pound. Although this paragraph does not prescribe what rate of duty shall be assessed upon the wires described in the proviso, yet it does contain a provision for a minimum rate, and the department is, therefore, of the opinion that the articles referred to are provided for in the said paragraph.

"As the second proviso requires the assessment of duty upon such articles as are manufactured of the wires provided for in paragraph 136, it follows that articles in chief value of wire dutiable under paragraph 199, but subject to the minimum proviso of paragraph 135, are subject to the additional duty of 1 cent per pound under the second proviso to the said paragraph."

INCREASING THE EFFICIENCY OF A BRASS MANUFACTURING PLANT

By P. W. Blair.*

No matter what size of a brass manufacturing business you control, whether large or small, the principles of efficiency can be applied successfully. Efficiency in a manufacturing plant is the developing of new methods and how to do better work in less time at lower cost of production. The principles of this science of business have only begun to be formulated. If production costs have been high the manager's method of attacking the problem in the past has been simply to try to lower wages or to add new machinery. If selling costs have increased he has tenaciously tried to increase selling prices, and in all of his movements he has usually been guided by accounting that was merely historic, not prophetic; and standards based on past performances, not carefully analyzing possible performances.

But, a changed mental attitude suggests a new approach under efficient methods. If costs of production are high, the business man will study the equipment that he has and make comparison with the latest on the market. He will study workmen and ascertain just what is a full day's work for these workmen and what will help and induce them to perform this full day's work. When selling expenses rise he will look first to the men who by word of mouth or by written words sell his products, and he will examine the standards against which these men are working and the exact methods they use. In this way, the manager will gain, the workman will benefit and the customer will profit. For the reduced cost to make the increase in wages, the reduction in prices comes from the application of principles of efficiency, not by skimping material or quality, but by finding how to use the least amount of the best—not by increasing the workman's pace, but by cutting his lost motions and applying his energy intelligently, not by increasing prices, but by increasing profits and by reducing costs.

In every brass manufacturing plant, whatever the line of work is composed of, it is possible to classify methods into two general divisions: First, those employed by the experts in the factory or office; second, those used by the ordinary routine worker. The latter class is almost certain to be many times larger than the first, and the methods developed by the expert should be adopted as standard. Standardization consists in reducing to written rules the best methods and prescribing them for general use, but, prescriptions are of no value unless they are used; so standardization amounts to nothing unless means are devised to put it into practice. Reduced to a broad table of classifications, efficiency resolves itself into the following program:

1st. Investigation by an expert of each department in the shop, to ascertain whether there is waste of any sort and how that waste many be minimized. In the foundry or shop, labor is the chief concern, and his instructions should be in his investigations to determine how the waste of time and energy may be reduced. This may often involve rearrangement of benches or machinery, and the determination of the best methods for doing the work. These best methods to be adopted as standard and the efficiency of the foundry or shop gradually brought up to them.

2nd. Following the establishment of standards, the development of a mechanism for carrying them into effect. Such a mechanism in the plant will enable the different foremen to assign each day a specific amount of work to each worker to accomplish; to also supply him with all the materials and appliances he needs to accomplish it.

3rd. Finding and training workers to follow these standardized methods.

4th. Providing for adequate compensation of the worker when he attains the standard of efficiency. Neither the average superintendent or foreman or mechanic knows off hand the best method for doing any new piece of goods the firm has adopted to manufacture, and place on the market, whether that work is at a bench or machine. They have not as a rule made a study of each and every detail and tried different methods of equipment for the elimination of lost motion in the manufacture of same. By allowing the expert in each department that will manufacture these goods to experiment on same and devise the best ways and means and record same on all the different operations that take place in the course of manufacture when these goods are delivered in large quantities, a standard has then been adopted and can be followed out in place of the old methods that some one has inherited or followed for years.

As an illustration I will give you an example of what has come under my own observation of an expert brass moulder studying the simple work of shoveling his sand into his flasks. This moulder was putting up on an average of 50 moulds per day on plate work using three shovelfuls to the mould, but by getting a shovel with larger capacity and same weight he was enabled to fill his mould with two shovelfuls of sand and increase his efficiency 5 per cent. Take for example a finishing shop that was badly laid out and that was doing a great variety of work. The machines were taken and arranged in groups; the Fox lathes were grouped in one division, the Monitor lathes in another and the Automatic machines in another, all assembling of parts were grouped in a separate department, and by this arrangement the foreman was able to supervise the above machines with more efficiency and increase the output 5 per cent., as the different articles were routed through in their allied operations and time saved in the transportation. In plants of any extent where a variety of product is manufactured, it will be exceedingly profitable to start an investigation on a study of operations on the different parts in course of manufacture, from the foundry until the goods are ready to ship. By a close study of same it may be found out there is not enough metal allowed on same for finishing, or, on the other hand patterns can have some metal taken off, a change of design to simplify or eliminate operations.

A standard time should be set for a day's work and all over and above that amount should be paid for on a bonus system. All up-to-date plants operating under efficiency have cut out the piece work system and have adopted the premium or bonus plan of wage payment, as it has proven to be the best and only plan for employer and employee. Compare the same with the old piece work system, in use in many of the brass manufacturing plants in the country. For example, a piece work rate may be set which is fair to employer and workman, but often neither know it. On the one hand, if the workmen "stand for it," the employer is afraid that he is not getting all he might out of it, and on the other hand, the workman, knowing the employer's fear, may be holding back on the job fearful that the rate will be cut if he accomplishes all he can. Examples might be given without number that the ordinary piece work rates are cut and that they fail in the greatest good to both parties

*Foreman Brass Finishing Department, H. Mueller Manufacturing Company, Decatur, Ill.

concerned. As an illustration, here is a young man who secures a job in a polishing department of a brass manufacturing plant. He is a green man and starts in at day rates to learn polishing. Specialized as such work is, he knows enough about the job in nine months to go on piece work. He exhibits a check in a few weeks in the family circle calling for fifteen dollars. "It is pretty good now," he says, "but it's as much as I will get if I work there five years." "How is that?" inquires the father, "you are on piece work and you will surely get more expert as time goes on." "Sure thing," says the young man, "but fifteen dollars is the limit and if any man runs over that in our room he will get his head punched and he will get the rates cut too."

All wage payments under efficiency are based on four principles, first, a large daily task for each man in the establishment. This task is not vague or indefinite, and is circumscribed carefully and completely. Second, standard conditions. Each man's task should call for a full day's work. At the same time the workman should be given such conditions and appliances as will enable him to accomplish his task with certainty. Third, high pay for success. Every man should be sure of large pay when he accomplishes a task. Fourth, when he fails he should be sure that sooner or later he will be the loser by it. But, this is the point; in no case should an attempt be made to apply these principles unless an accurate and thorough time study has been made of every item entering into the day's work.

Take the subject of detail operations. There are quite a number of heads of brass manufacturing plants who sneer at the mention of motion studies. They have asserted to me that they have been making these goods for the past twenty years and they cannot see how any one can show them a quicker and more economical way to handle same. It is just the matter of simple common sense of taking the short cut of saving work and time. The fact that the saving is made in minutes, scraps, seconds, fractions, etc., is what often leads them to think that motion studies are petty triflings and theoretical. If they would look at the matter from an efficiency standpoint they would be surprised. The majority of the employees in the factory are doing the same identical thing over and over, day after day, year after year. If they lose one second on a motion, that second grows into hours, days and weeks of wasted time that costs hard money. There is the easiest and quickest and best way to do every operation that takes place in a brass manufacturing plant. By introducing efficiency and finding out in a common sense and deliberate study instead of leaving the workmen to blunder upon it or to miss it.

The best progress to be made in eliminating lost motion is to start in at the foundry and take the different departments in detail handling of molds and castings, riddling sand changes in tools, fixtures, jigs and dies. When the different operations are standardized on each part or piece of work then thorough instruction of the operative who is to take up the process and see that same is carried out. Efficiency stands for the adoption of standard methods, such details for instance as the care and tightening of belts, the grinding and angle of forming or undercut tool, the establishment of a complete tool room from which tools are issued under a check system. The grinding of all tools possible by a tool grinder, Fig. 1. See old way of grinding tools, Fig. 2. See new way under efficiency. Grinding tools the old way wasted the time of the men and resulted in non-uniform tools. Under efficiency the tool grinder and tool keeper save time and make standardized cutting edges possible.

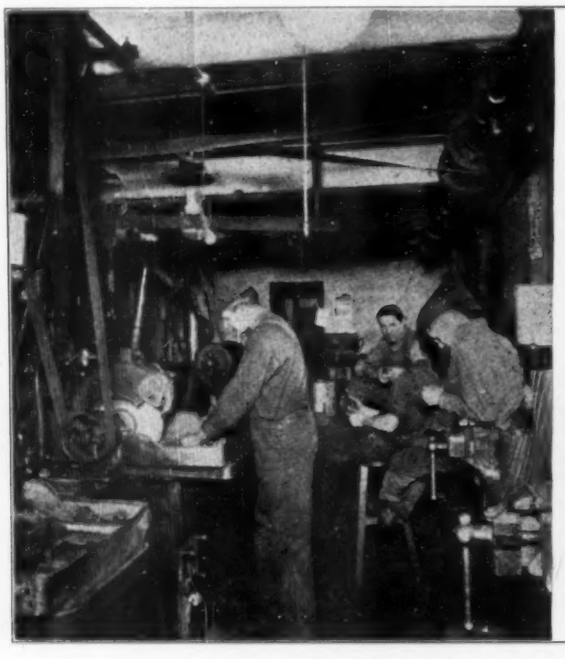


FIG. 1. OLD WAY OF GRINDING TOOLS.

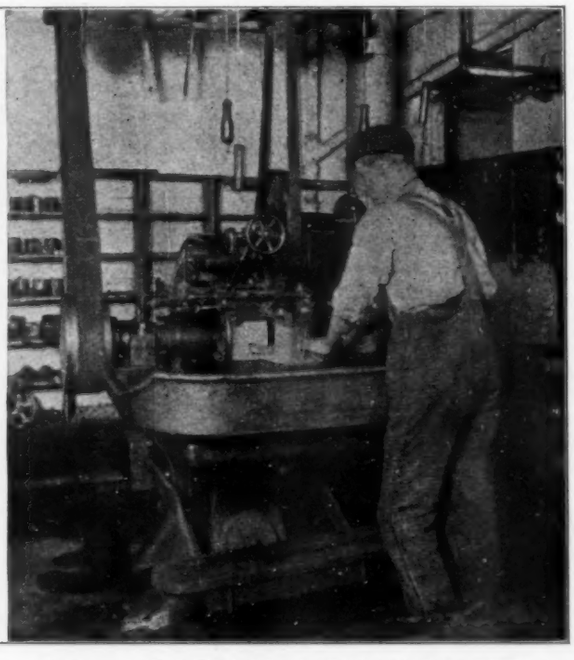


FIG. 2. NEW WAY OF GRINDING TOOLS UNDER EFFICIENCY SYSTEM.

So complete has been the transference of skill that today hand tooling or turning on a speed lathe is becoming a vanished art in American brass manufacturing shops. Very few lathe hands can chase a thread with hand tool, yet all can cut good threads with threading dies any pitch or diameter and in the case of the Fox lathe, they are also superseding it. After the traditional skill of a trade, or the special peculiar skill of a designer inventor has been transferred to a machine an operator with little or no acquired skill can learn to handle it and turn out the product.

THE IMPORTANCE OF DESIGN IN THE DEVELOPMENT OF THE ART METAL INDUSTRY

By A. F. Saunders.*

It is interesting to note the great progress made in design as applied to the various lines of art metal wares seen in the shops of the present time. It seems safe to say that, without exception, we can not single out any one industry, where the element of art enters into its production that shows a greater improvement in aesthetic composition, originality of thought, or a closer incorporation of true principles than is found in the modern metal work of the last ten years.

This perhaps may seem a rather broad assertion but stop and consider for a moment. Go back in memory, think of the limited amount of metal ware produced say twenty years ago that was worthy the much abused name art. Aside from the work of the gold or silversmith it was quite impossible to procure any American product in metal, that in design or finish there entered any artistic taste whatsoever. Whereas now there can plainly be seen a widespread movement practically universal among the manufacturers of metal ware of all kinds to improve their product, especially from an aesthetic standpoint as well as that of utility. This progress not only applies to the development of the gold and silversmiths' craft, but also, and if anything to a greater degree does it apply to the metal work of a less costly nature, such as silver-plated ware, articles in bronze, copper, brass, pewter, spelter and even so common and cheap a metal as lead.

It should be a source of keen satisfaction and gratification to our metal designer to see this growing appreciation of his untiring efforts for the advancement and betterment of his craft. I say craft because the modern intensive designer not only studies the formative and decorative possibilities of his art, but is in constant and close touch with the production and commercial side of the industry. Through this co-operation and his practical understanding only, has it been possible to attain this gradual development along lines of artistic design, practical utility and commercial success.

This progressive art movement in the metal industry has not only proven a developer of business to both the manufacturer and the merchant, but has also been of great educational value to the ultimate consumer who has become far more discriminating today than was the case not so very many years ago. This progress is without question due principally to a better understanding and consequent appreciation of the value of good design, also a closer relationship between the production and art department.

It is a common mistake to suppose or assume that factory-made wares cannot possess truly artistic or aesthetic quality and we must admit that while the individual hand-wrought article possesses a certain amount of personal value and charm lacking in like articles manufactured in quantities and supplemented in their production by the aid of the machine; it should, however, be remembered that the latter have a greater influence upon the tastes of the great masses of purchasers frequenting the marts of the present time, hence any real artistic improvement of the factory-made product is most commendable, and should be given every encouragement. Undoubtedly the arts and crafts movement has greatly influenced the advancement of modern design and workmanship. It has developed new lines of thought and has created a growing desire for newer and better things, its very keynote is simplicity, a fundamental principle of good design. This spirit has entered largely into the designing of metal wares of the past few years and with most pleasing results.

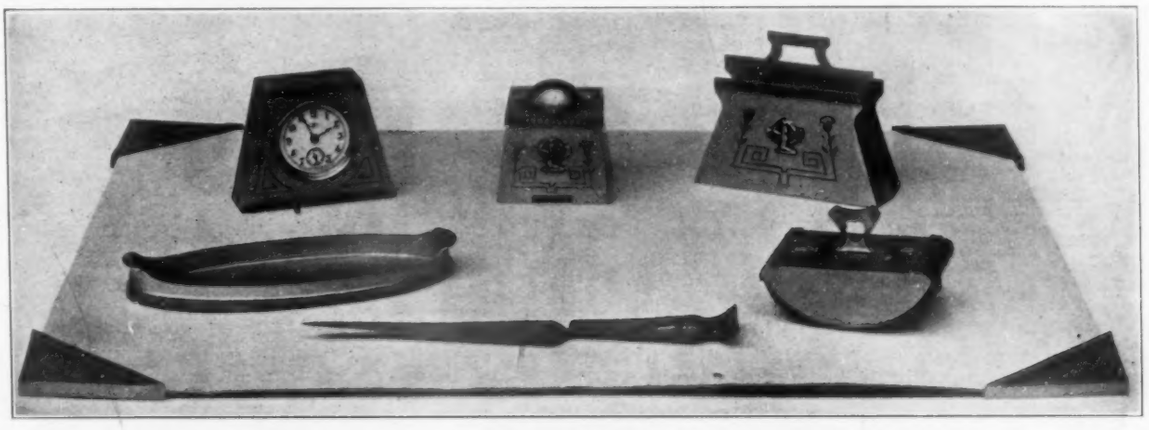


FIG. 3. ART BRASS DESK SET, MODERNIZED EGYPTIAN, GREEN AND DULL BRASS, COLOR HARMONY IN FINISH.

Broadly speaking, there is a growing feeling toward art in this country, a greater desire than ever before to secure things that are beautiful and artistically correct. We are rapidly outgrowing that apparent love for mere show, so pronounced in the over-decorated period of the last century. We are no longer content with the copying of hackneyed decorative styles of former periods having long out grown their usefulness, and entirely devoid of any meaning to the art of America. While there is a growing appreciation of the simple yet truly beautiful style of our Colonial period this feeling is most proper and can be understood as being most representative of our best ideals. In no industry is this Colonial revival more pronounced than in the work of the silversmith, and it has aroused the modern metal craftsman to the artistic value of good form and simple decoration in the designing of his product.

Again referring to the development of art metal work in materials (other than the precious metals) where gold and silver are used in small proportions either from an economic standpoint or for purely decorative purposes, such as gold or silver plated work or in decorative com-

*Expert Designer, Benedict Manufacturing Company, East Syracuse, N. Y.

bination with such cheaper metals as bronze, copper or brass, here are unlimited possibilities for the designer and there is no reason for a lack of good form, judicious decoration or artistic finish in his work..

It is truly remarkable the progress made in what has come to be known as art brass, and while vast quantities

FIG. 1. ART BRONZE AND SILVER SMOKING SET.
Example of modern treatment in design, color harmony in combination finishes.

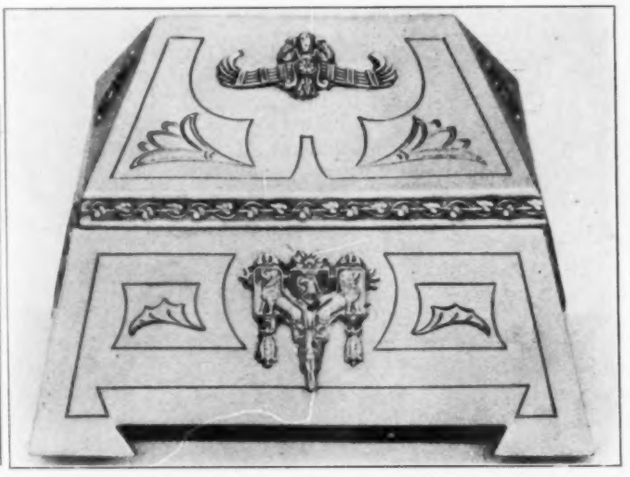


FIG. 2. CAST JEWEL BOX,
Modernized Assyrian, finished in antique gold; example of art finishes.

of crude productions have been turned out under this name, nevertheless there has developed a widespread demand for brass ware of real artistic merit. Again I say that without question this demand has been created through the application of good design. It matters not what the nature of a material may be, it possesses artistic possibilities if its limitations, manipulation and proper finish is thoroughly understood. Such knowledge combined with a good training in the true principles of design must place our metal work on a higher artistic plane. Surely the outlook is most encouraging for an even greater improvement and development both in the design and production of art metal wares of every description.

"ABOUT SHERARDIZING"

A Description of the Latest Practice in the Coating of Iron or Steel with Zinc.

By Thomas Liggett, Jr.

While the subject of this article is "About Sherardizing," I do not think it will be diverging too far if I say a few words about cleaning castings. There are several methods of removing the silica coating—the oldest is that of pickling with hydrofluoric acid. While this method has its advantages it also has its drawbacks—the worst feature of using acid on castings is that if there are any imperfections on the surface the acid gets into them and it is almost an impossibility to remove it. The manufacturer is never sure that the acid has been neutralized, and the result is that to all outward appearances the acid is removed, but it is not very long until the coating is destroyed. Again, if the casting has a high plumbago face the acid will not remove this substance and the clean iron surface is not exposed. Sand or shot blasting is fast displacing the pickle method and is much safer as there are no acids used. The surface of a sand-blasted article is absolutely clean and it has a uniform appearance. Tumbling and water rumbling-barrels are used to some extent and give very good results.

In the early part of this century Dr. Sherard Cowper-Cowles was doing experimental work in case-hardening with a great many different substances. During his experiments he procured some "blue powder" or zinc dust. He carried out the case-hardening operation at a temperature below 788 degs. F., or the melting point of zinc. After the material and zinc dust had become cool he took the material out and found that it had a zinc coating. This was something entirely new, *i. e.*, a piece of metal taking a zinc coat at a temperature below the melting point of zinc. After very thorough and exhaustive tests, it was found that this coating gave the underlying metal better protection from corrosion than the well known hot or electro galvanizing, and patents were taken out in all the principal countries of the world. Realizing that this new process of galvanizing, known as "Sherardizing" (taking its name from Dr. Cowles' given name), was of commercial value, the United States Sherardizing Company was formed, whose business it is to exploit the process in the United States.

The apparatus necessary to install a sherardizing plant is somewhat varied. By this I mean the plants are built to treat different classes of material. For instance—a plant designed for bolts, nuts, small castings, etc., would not be suitable for pipe. The essential apparatus necessary for a sherardizing plant is an oven large enough to receive the retorts, and the retorts are built to receive the material to be treated in the most economical manner. The largest retorts in use today are used by the Mark Manufacturing Company of Chicago. They are twenty-six inches in diameter by twenty-three feet long and are designed for merchant pipe. The number of drums or retorts which are used at one time depends on the daily requirements, and the ovens are built accordingly. The retorts are loaded with material and zinc dust or dross and run into the oven, and heat is applied. Any of the common fuels will answer. The only thing to be sure of is that the oven has an even temperature. The retorts are left in the oven for a given length of time at a constant temperature and then removed. When they can be han-

*Paper presented at the Buffalo meeting of the American Foundrymen's Association, September, 1912.

dled they are opened and the material and dust are dumped on a screen or grating. The dust falls through and is ready to be used again and the material is finished, being covered with a continuous even coating of zinc iron alloy, with a very thin layer of metallic zinc on the surface.

No matter how irregular the shape of the material may be, it has a uniform coating and every letter or thread is reproduced, which is not the case in either electro or hot galvanizing. In electro galvanizing the hollow places are not coated, and with hot galvanizing, threads or hollows are filled and flaws are covered.

The zinc dust which is used in the process is a secondary product from a zinc smelter and is recovered in the flues. The dust is composed of from 85 per cent. to 92 per cent. metallic zinc, about 7 per cent. zinc oxide, and some other impurities which are not in sufficient quantities to work any injury. Zinc dross, the material which settles at the bottom of a hot galvanizing kettle, can also be used instead of dust and it has its advantages. Pulverized zinc is used to keep the dust of a constant metallic zinc content.

To date there have been several theories advanced as to the action which takes place in the drums during the process. Some authorities in England and a well known authority in this country persist in referring to it as the vapor process. This theory is absolutely without foundation, for it there is material in the same drum that is of a different thickness, it is found that the thinnest or lightest material has a heavier coating than the larger material. Now if this was a vapor process the heavier objects, which are the cooler, would have the heavier coating. Again, if a vessel is taken and a casting and zinc dust placed in it, and then the casting is moved around so that there is a cavity of 1000th inch formed and then try to sherardize it, it is found that the casting is only coated where it is in contact with the dust. Now if this was a vapor process the vapor would certainly travel this short distance. We do know that zinc and iron when heated slowly together have an affinity for each other, and some of the authorities claim that this affinity is produced by a very slight magnetic action.

The following facts have been demonstrated:

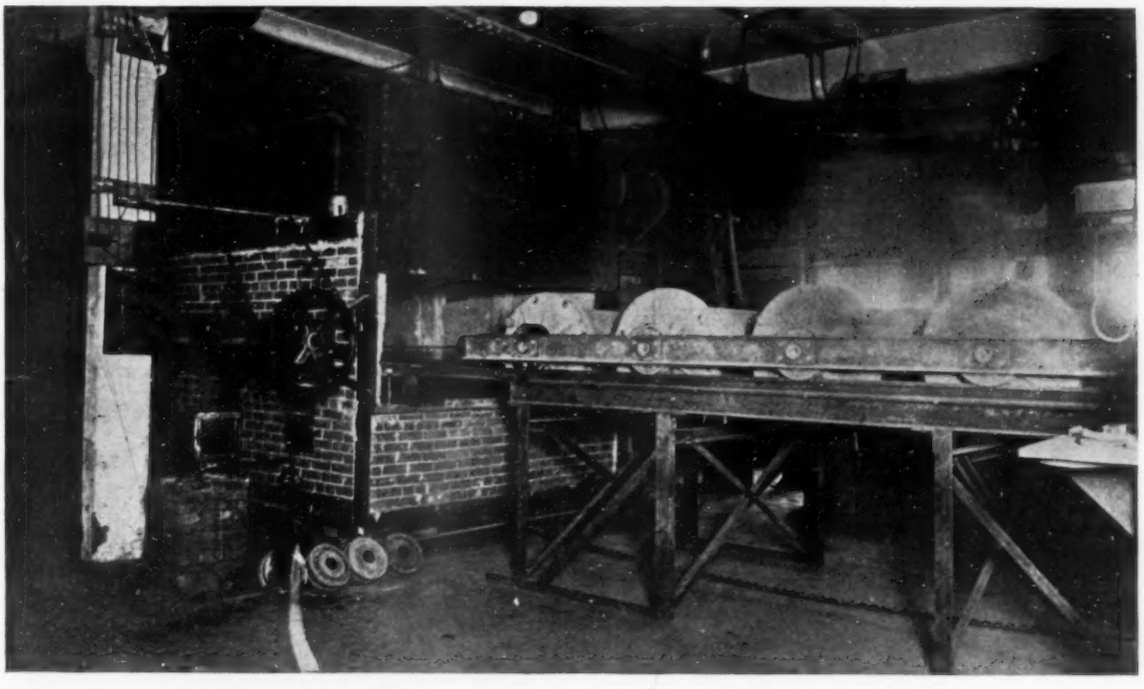
First.—If the metallic zinc content in the dust is kept constant we will get on the same class of materials equal weights of coating, under the same temperatures and time of treatment.

Second.—Zinc does not begin to deposit until the material has reached the temperature at which magnetic oxide of iron appears.

Third.—That iron which oxidizes with difficulty, sherardizes with difficulty.

Fourth.—The coating is a true zinc iron alloy. I believe that the magnetic oxide of iron which forms on the material is reduced to metallic iron by contact with zinc, which alloys with the excess zinc and exactly replaces the film of magnetic oxide that was first formed.

Dr. Cushman, in a recent paper that has been very broadly circulated, claims that he has found an average of 30 per cent. iron in the sherardized coating. This is contrary to our experience. It has been found that the coating is a definite alloy and carries from 8 to 12 per cent. of iron—this is known as FeZn10. Zinc thoroughly saturated with iron does not contain more than 12 per cent. iron. The composition of a sherardized coating contains an average of 10 per cent. iron and 90 per cent. zinc, while the hot galvanized coating contains 94 to 95 per cent. zinc, and the electro-method is practically 100 per cent. zinc. The zinc iron alloy being a definite homogeneous alloy has a definite melting point of 1260 degs. F. against 788 degs. F. for zinc. This, under some conditions, is very valuable.



PLANT OF OHIO SHERARDIZING COMPANY, SHOWING OVENS AND DRUMS.

The principal factors that are necessary for a protective metal coating are : (1) Continuity and adherence of the coating; (2) Durability of the coating metal; (3) Galvanic or electrical potential of the coating with respect to the underlying metal.

(To be continued.)

THE MANUFACTURE OF WROUGHT BRASS

A Description of Modern Methods for the Production of Plate, Sheet, Rod, Wire and Tube.

By L. J. Krom.

(Continued from August, 1912.)

BRASS TUBES.

Brass is manufactured into tubing of two distinct types, brazed and seamless. The brazed tube will be described first, as the process of making it follows as a direct sequence in the manufacture of sheet or strip brass. Brazed tubing takes its name from the fact that it is made from a strip of flat metal formed up into a tube, and the seam thus made is soldered or "brazed," after which the tube is drawn down to a smaller diameter and the seam smoothed out. The brazed brass tube fills a very large

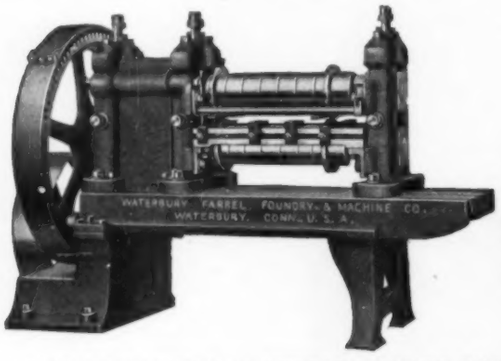


FIG. 45. SLITTER FOR SLITTING STRIP METAL.

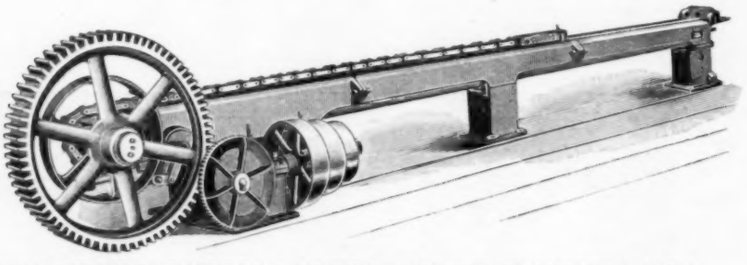


FIG. 46. DRAWBENCH FOR DRAWING THE TUBE BEFORE AND AFTER BRAZING.

SOME TUBE-MAKING MACHINERY MADE BY WATERBURY FARREL FOUNDRY & MACHINE COMPANY, WATERBURY, CONN.

field. It is used in a great many cases where a seamless brass tube can be applied, but is found to be too expensive, the brazed tube being much the cheaper, but, on the other hand, the brazed tube is made of lighter gauge and consequently will not stand the same pressure as a seamless tube. The brazed tube is found in gas and electric lighting fixtures, bedstead work, household furnishings, as curtain, portierre and shade holders, and in a great many uses as a coating for iron pipes where it may be either a lock jointed brass cased iron tube or a brazed brass tube iron lined; also used in bedstead work and for ornamental purposes, such as railings, etc.

The manufacture of the brazed brass tube, then, starts with a brass strip rolled to whatever gauge it is desired to make the tube of and of a width convenient for the after slitting for tubes. After the strip has been rolled to the ordered gauge by the mill, it is given a final annealing and pickling. It is then trimmed and slit on a single gang slitter, as shown in Fig. 45. From the slitter the metal in strips of the required width is passed through a forming up die in a draw bench, as shown in Fig. 46, or is put through the tube forming machine shown in Fig. 47. This forming mill has, as will be seen, a series of holes through which the metal is passed, and is thus rapidly formed into a tube with an open seam, and is then ready for brazing. The tubes may be given a final draw on a bench after brazing to true them up. The rolling operation being very rapid, is much more economical than the old process formerly in use for forming up brazed tubes by drawing them through forming dies.

These machines are to be had in two sizes. One which will form up small tubes five-eighths of an inch or less in diameter, such as are used on curtain rods, and the other is a larger one, as shown in Fig. 47, which is used for forming commercial sizes of brazed tubing of two and one-half inches in diameter or less. As an example, to make a tube of this character a strip of metal 4½ inches wide, No. 18 gauge, will give a tube finished after forming, brazing and drawing with a diameter of 1¼ inches, and No. 20 in gauge, this is a reduction of one-quarter of an inch in diameter and of two numbers in gauge, and may be taken as typical of brazed tube work.

Besides the machinery mentioned above as essential to the making of brazed tubing, there are used draw-benches for drawing after brazing, as shown in Fig. 46. Brazing furnaces, as shown in Fig. 48, saws for trimming and cutting to length, and various forms of special machines for turning out tubes of fancy designs, such as roped, twisted, spiral, etc.

Brazed brass tube is made from a mixture of from 68 to 75 parts of copper and from 25 to 32 parts of spelter. Great care must be exercised in brazing the mixture of 68 parts copper and 32 of spelter, as the difference in the melting point of the solder used and of the tube itself is not very great, and there is danger of melting the tube. The mixture 72 to 75 parts of copper and 25 to 28 parts of spelter are more generally used today. The solder

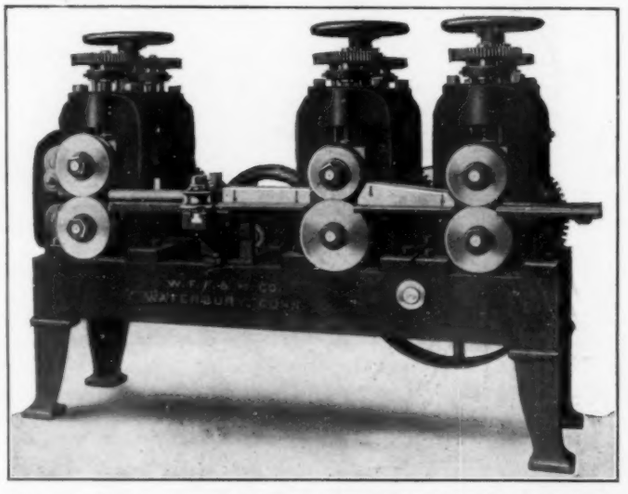


FIG. 47. LARGE SIZE MACHINE FOR FORMING UP METAL FOR MAKING BRAZED TUBING.

used in the manufacture of brazed tubing is that known as half and half, or hard solder, consisting of 50 parts of copper and 50 parts of spelter. The solder is made by melting the copper and zinc together and pouring into iron molds. After the metal has cooled it is in some mills heated red hot, broken into small pieces and finally beaten

to powder in a mortar by hand or power. In other mills it is ground up hot in a big mill similar to a coffee mill, and in some cases it is crushed up cold in a steel breaker that breaks it up sufficiently for screening. In all cases the solder is sized by screening before being used. There are other mixtures of brass or hard solder made, ranging from 80 parts of spelter down, but only the "fifty-fifty" is in general use for brazed tubing.

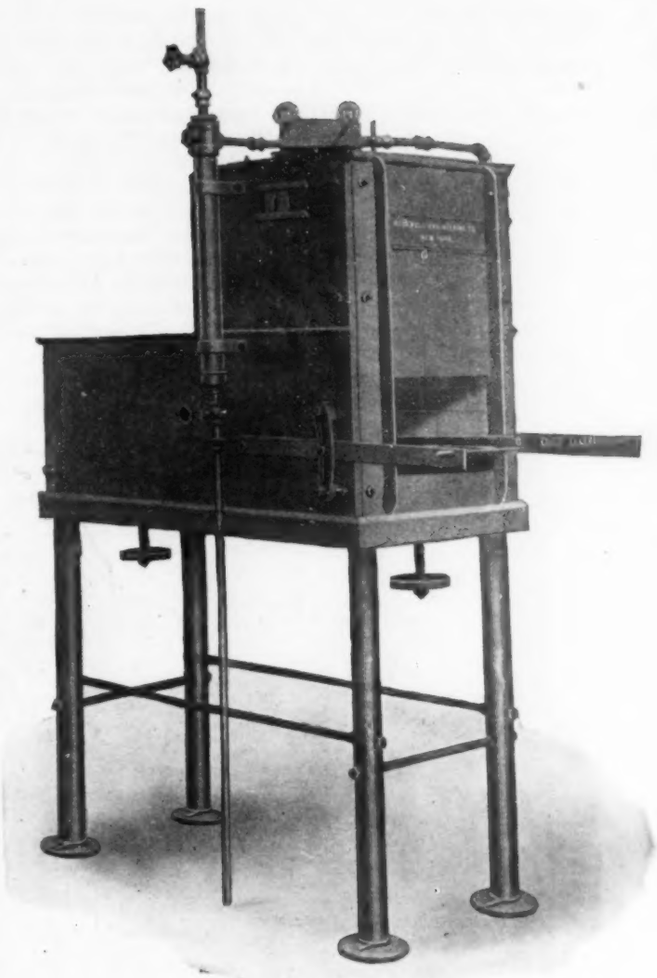
THE FLUX.

As in the regular line of soldering there must be a flux to enable the solder to flow freely and at the same time stick to the tube. The flux most generally used is borax, which has been fused so that all of the water of crystallization has been driven off. The borax in its crude state is used and heated in an iron pot or crucible until it is melted clear. It is then poured out and finally ground to powder in a mill. In some places there is some other "secret" compounds mixed with the borax, but they are of the nature of carbonate of soda, boracic or boric acid, potassium carbonate and nitrate and various other fluxing compounds, which only add to the expense and do not do much good. At one time a mixture made up of borax, half and half and fine aluminum powder enjoyed a fine sale for brazing tubes. The flux and the solder worked all right until it happened to be used on some plumber-supply tubes that were nickel-plated. The plater not being aware of the aluminum in the seam, did not make any particular preparations for plating it, and the consequence was that there was a lot of trouble in a particular mill. Several men lost their positions and considerable business was lost through delay in filling orders, until finally the chemist of the works traced the trouble to the new solder and the aluminum was eliminated.

(To be continued.)

EXPORTS OF METAL WORKING MACHINERY.

During 1911 the United States exported metal working machinery to the value of $9,626,000, which was over 60 per cent. more than the preceeding year. The major portion of this machinery went to Germany, Great Britain, France and Canada.



BRAZING FURNACE USED IN MANUFACTURE OF BRAZED TUBE. BUILT BY ROCKWELL FURNACE COMPANY, NEW YORK.

EFFICIENCY AND ECONOMY IN THE PLATING ROOM.*

By H. E. Willmore.

Electro-plating, differing, as it does, from all the other branches, occupies a unique position in the manufacturing industries, for, while the superintendent of a factory may have a general knowledge of the other branches of his business, he seldom knows anything of the plating end. He invariably is entirely ignorant of the principles of electro-plating, and from his unfamiliarity with the subject frequently imposes conditions on the plater that are at variance with the experienced man's practical knowledge of what should be the proper condition of the work before it is taken to the plating room, to insure the best possible final results.

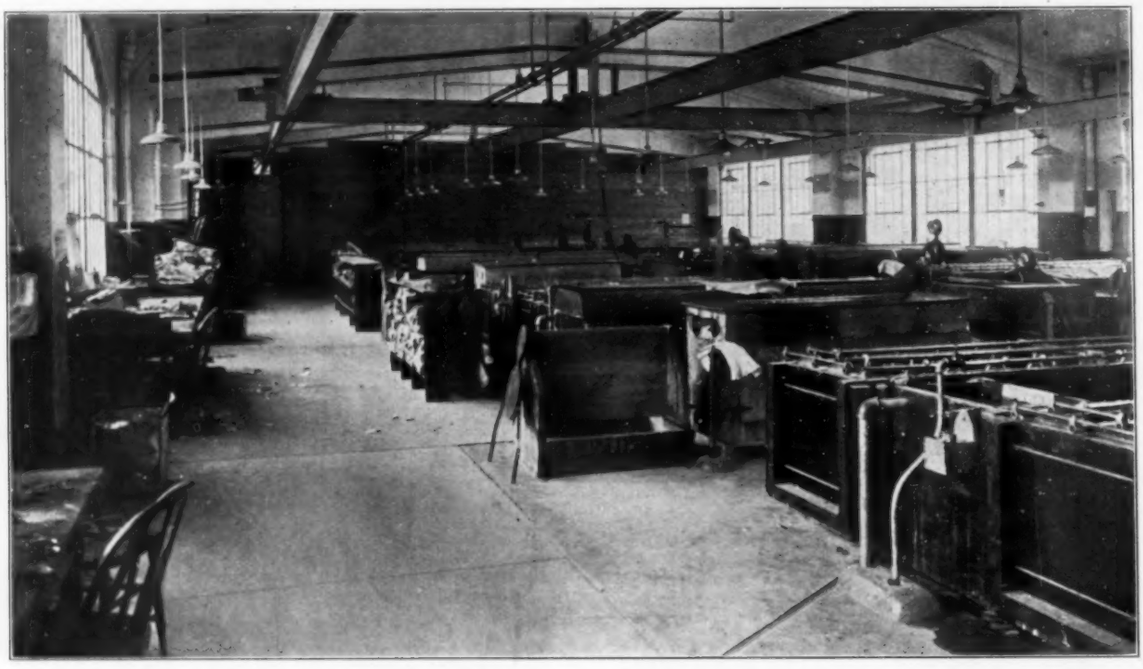
As having a direct bearing on plating room economy, a thorough inspection should be made of all work before it is allowed to go to that department, for it has frequently been my experience to have to replate work because it had not been sufficiently machined, the polishing was of an inferior quality or for other reasons that were not discovered until after the plating had been accomplished. In this connection also, if the management would give respectful attention and thoughtful consideration to suggestions from the plater there would be a resultant improvement in both quantity and quality of the output of the plating room.

Considering the importance of the position of plating room foreman, the factory management should exercise unusual judgment in the selection of a man to fill it, for the one occupying such a position must be possessed of several qualifications. He must have an education along technical lines and practical experience. Efficiency comes from technical knowledge relating to electro-chemistry and gives a deeper insight into theoretical matters enabling the plater to arrive at scientific conclusions, which are of material benefit in solving plating problems without costly experimentation. In combination with practical experience he is the better enabled to produce results economically than the man who is lacking in these essentials, for the electro-plating profession is one in which theory and practice must be judiciously mingled. The knowledge necessary to guide his executive actions can be acquired only by experience in the plating department.

The employer who engages an inefficient plater pays dearly for his services, for the inefficient plater is extravagant and wasteful in the use of chemicals, having nothing to guide him in their use beyond his guesswork methods. I could cite numerous instances that have come

*Paper read before Chicago Branch of the National Electro-Platers' Association, Chicago, Ill., December 14, 1912.

under my observation as to the wasteful use of material occasioned by the incapability of the plater. One instance I have in mind will, perhaps, suffice to illustrate this point. Having occasion to visit a plating room some time ago, my attention was attracted by a pile of empty cyanide cases. Upon inquiring of the superintendent how much cyanide was being used, I was informed it amounted to a case (112 pounds) a day; and this at a cost of over $20 a case. Another plating room with which I was familiar, using a much larger quantity of solution, was consuming a little over a case a month, and during that year used, all told, 15 cases, depositing over 2,400 pounds of copper, over 800 pounds of brass and other metals in smaller amounts, all from alkaline solutions. In the first instance a large part of the cyanide was used in removing the deposit from work that had failed in the plating operation, either because of improper preparation or the condition of the solution. While this may be an exceptional case, still there are numerous instances existing that are nearly as bad and are sufficient to prove that the incompetent plater is an expensive proposition.



The above picture shows a view of an uncompleted plating room at the plant of the Spirella Company, Niagara Falls, N. Y., manufacturers of corset hardware. This plating room, of which one-half is shown here, will be 270 feet in length and 48 feet wide, and will contain sixty-six plating tanks, each 10 feet long, 30 inches wide and 24 inches deep. The tanks are all equipped with Leffel anode hooks which were described in THE METAL INDUSTRY for October, 1912, and are the invention of C. E. Leffel, the superintendent of the plant. This company has also specially constructed acid storage rooms, chemical storage rooms, vaults for metal, foundry for manufacturing anodes, large two hundred barrel cistern with filtered water for solutions, in fact, they believe it the best and most modern equipped plating department in the world.

The source of economy is not alone in the saving of supplies, the greater saving is in the management and direction of plating room help. It makes no difference what the plater's education or experience has been if he is lacking in the power of application, for knowledge unaccompanied by executive ability is of little value. The plater should, therefore, have executive ability and initiative, be progressive, have original ideas and be able to devise means, both mechanical and chemical, for the rapid handling of all classes of work. The methods by which unnecessary expenses may be eliminated depends on the experience and efficiency of the man in charge of the plating department and must be devised from his familiarity with the details of his profession and his ability to suggest means for accomplishing the necessary work by the shortest and most effective methods. The competent man knows all of the short cuts for facilitating the output and takes advantage of possibilities as they present themselves. He must also possess keen insight, be intelligent, forceful and energetic because these qualities are of definite value in plating room management in arriving at methods for the reduction of plating room costs. The progressive plater takes pains in instructing his assistants in the various operations and in teaching them the necessary details of the work they are employed upon. The result is co-operation and a personal interest in their work. He should organize an economic production system and insist that the help follow that system. This not only takes a lot of work off his own shoulders, but makes for the reduction of costs and improvement in the quality of the production.

As direction determines success or failure, so the foreman by discernment should be able to detect the workman's adaptability for the work he is given to do. In selecting help for the plating room, consideration should be given to their fitness for the work they are to perform, for there is no part of the manufacturing business that requires more intelligence of the help employed than that department. I have been in a plating room where fifteen men and boys were employed and only one of them was able to speak the English language. When carelessness was observed the foreman was handicapped by first having to go to this one, who acted as interpreter, and have him explain where the man was in error, the effect of the correction being lost in the time consumed between the commission of the act and the correction. Another loss is sustained by thoughtless help in removing work from the plating tanks. Instead of allowing sufficient time for the solution to drain off the work, it is pulled out of the tank with the solution running off in a stream on to the floor. This loss will amount to several gallons a day in a fair sized plating room, and has to be replaced by

constant additions at the rate of from 25 cents to $2 or more a gallon if the solutions are to be kept up to their normal metallic standard. The man in charge of the plating room must study methods and labor from the efficiency standpoint if he would get the greatest earning capacity out of his help, and this is where his judgment of human nature plays an important part.

A source of expense frequently overlooked by the management of a factory is in supplying the foreman with help to replace those that have quit their employ. Especially is this true when the foreman is working his men to the limit of their capabilities. The overhead expense remains the same while the continuity of the output is retarded and quantity curtailed, if the vacancies are not immediately filled. In the successful handling of help the foreman must be diplomatic, for while a certain amount

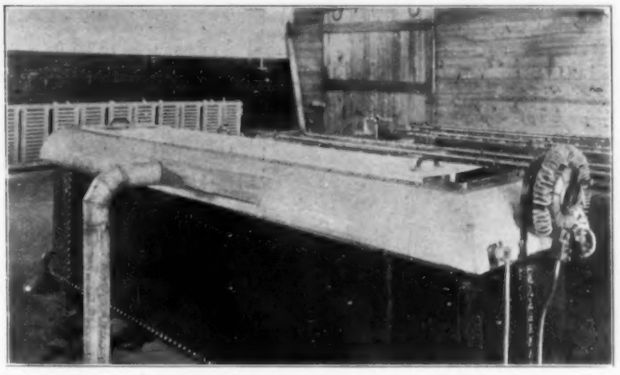
The above picture shows the generator room of the Spirella Company, Niagara Falls, N. Y. This room is on a mezzanine floor directly under the plating tanks, and when finished will contain twenty-two separate units. The machines on the right hand side are direct connected sets 6 volts 600 amperes; on the left hand side the machines are 7 volts, 1,000 amperes, all direct connected sets separately excited. The large type machine is used for plating units on the second floor, and also for plating apparatus on the first floor. There are two special electro-cleaning rooms and also installed in this mezzanine floor, two 15 volt, 1,000 ampere cleaning dynamos, making in all twenty-four separate dynamos on the one floor.

of shop discipline is necessary, a too rigid enforcement of arbitrary rules is deterrent to the existence of the good feeling that should exist between the foreman and his subordinates, and frequently results in an antagonistic attitude on the part of the help which, of course, is costly. At times kindly suggestion accomplishes greater good than harsh criticism and tends to produce an increased efficiency of the workers, which is good for the firm, the foreman and all concerned.

Plating room conditions are frequently the cause of wasted time and the plater in installing the different apparatus should give due consideration to the arrangement of cleaning and preparatory appliances. These should be conveniently placed so that all unnecessary steps to the plating tanks are eliminated, for these are factors tending toward economy. Cleanliness is another condition that is of economic value in the plating room, not only in preparing work for the plating operation but also because a cleanly environment has a salutory influence on the help employed, in that they are better satisfied to remain in their positions than if the conditions were unwholesome. The "breaking in" of new help is a costly item. Several of the states have legislated against the dingy basement and cubby hole plating room and now demand that the poisonous gases arising from plating solutions shall be carried away, either by natural ventilation or by exhaust fans. This also tends toward economy as anything that impairs the health of employees reduces their efficiency.

Greater strides for the economical production of plated articles have been made in the past 10 years than in all the previous history of electro-plating and this, in a large measure, is due to the introduction of the electric cleaner and mechanical plating devices, such as the rotary plating barrel and automatic plating tank. The plater himself is showing a keener desire for a greater knowledge of his art. The platers who have not kept up with the procession of progress are generally lacking in everything approximating ability. They have no original ideas; they are bound down by precedents which have ancient sanction and they look upon the up-to-date plater as their natural enemy. These are the misfits in the plating profession and their day of good fortune is past. I have enumerated only a few of the conditions, systems, facts and principles that make for efficiency or economy in the plating room. Any experienced plater could suggest an endless addition to the list that in many cases are beyond his control or out of his jurisdiction.

I would not be doing full justice to the subject should I fail to give credit to the ably conducted trade journals that have come into existence within recent years and devote large space to the art of electro-plating. These have been the means of educating the platers to a better understanding of their work by the publication and circulation of the description of methods used by the more advanced and better informed men in the profession, men



The tank shown in the picture is one of twenty-two hot-cyanide copper solutions at the plant of the Spirella Company, Niagara Falls, N. Y. This tank has a special form of hood patented by C. E. Leffel, superintendent. The hood is designed to carry away the injurious fumes. The hood is piped through the first floor into a concrete duct, which passes under the floor to the rear of the building where a large exhaust fan exhausts the fumes through a stack 50 feet in the air. The plating room is well ventilated with a cupola roof, and visitors coming into the room who are familiar with fumes that usually generate from plating baths remark that the air is as pure as the air outside.

who have given deep thought and long study to the principles of electro-plating and have become authoritive on the subject and by these mediums have been enabled to send broadcast the results of their experience to the less informed whose opportunities for investigation have not been as great.

VOLATILIZATION OF METALS.

Even platinum may be volatilized, and Sir William Crookes finds that at 1,300 degs. C. it loses one per cent. of its weight per hour. Palladium loses 0.007 of its weight; iridium, 0.008, but rhodium shows no loss.

CASTING MILLING CUTTERS AND SIMILAR TOOLS IN HIGH SPEED STEEL

A Description of the Preparation of Tools Used in Automatic Brass Working Machinery.

By Ernest Dietz.

If we compare a finished endmill with the piece of bar stock necessary to make it, two things impress themselves upon our minds at once: first the large difference in weight between the raw material and the finished article, and second the amount of labor necessary to remove this metal in order to make the finished tool. If we take for example a 2-inch endmill with the usual No. 4 Morse Taper Shank we find that the finished tool measures 7¾ inches in length, necessitating about 8 inches of round bar stock not less than 2 1-16 inches diameter. The actual cutting portion of the tool is 2 inches long, the No. 4 taper shank approximately 4¾ inches.

This material weighs 7.5 pounds and the finished tool 3.1 pounds or less than half of this amount. Or, in other words, more than half of the material costing from 50 to 75 cents per pound has been machined away at a labor and machine cost of about 75 cents per hour, and is a total loss in the form of turnings and chips. After the tool is finally finished and in operation we note that the only part of it doing useful work and requiring the high-grade material is an exceedingly small portion of the 7.5 pounds of material which were necessary to make it. The logical method of effecting a saving suggesting itself would be: to make the shank of the endmill of a lower grade of steel using the high-grade material on the cutting portion only.

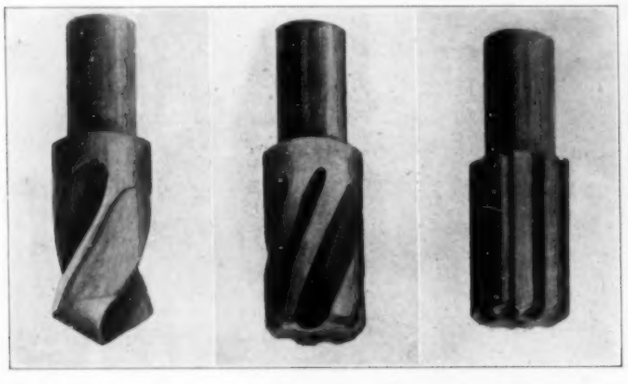


Fig. 1. Cast High-Speed Steel Twist Drill for Turret Lathe.

Fig. 2. High-Speed Steel, 3-Groove Drill.

Fig. 3. Cast High-Speed Steel Chucking Reamer.

This principle is worked out in the Shell Endmills of various types and designs as furnished by the manufacturers of small tools. But here it appears that the labor cost of accurately finishing the hole in the cutter more than overbalances the saving in material so that nothing is gained by substituting the necessarily weaker construction of the built-up tool, for the solid shank endmill. A series of experiments in the composition of various alloy steel castings, for use in automobile construction, suggested to the writer the possibilities of casting high speed steel cutter heads on to a previously finished shank of carbon steel. The patterns were provided with core prints which were duplicates of the finished shanks. After removing the pattern from the mold the steel shank was placed in the mold as a core would be and the cutting head cast around it. The part of the shank projecting into the head was rough turned; in fact, the coarse feed used gave it the appearance of being threaded.

The metal was heated in a small electric furnace of the resistance type, using a No. 2 crucible. No difficulty was experienced with this furnace at the high temperatures necessary to handle this material and the work being experimental the current consumption which was rather high per pound of material melted, was not considered. In the molding the regular steel foundry practice has been followed as far as the drying and baking of the molds and cores is concerned. In addition to this experiments are being made with several materials of a higher heat resisting power than the commercial foundry facings so as to secure a very smooth surface on the castings. This is necessary as the grooves and teeth are cast into the tools and end mills so that the only finish necessary is the grinding of the cutting edges.

A number of end mills and similar tools, ranging in size from 1¾ to 3½ inches in diameter, were made and tested out. The results of these tests were a surprise, as it was expected that in general efficiency these tools would range about midway between a carbon and a high-speed tool. A number of them in operation under similar conditions as to cutting speed, lubrication, feed, depth of cut, alongside of high-speed cutters of the same size made from bar stock, have, after tests extending over a period of several months, shown up in general efficiency as well and in some instances better than the machined cutters. They were used on aluminum, bronze, manganese steel castings, nickel-steel forgings and cast iron. It was while operating on manganese steel castings that the cast cutter stood up about ten per cent. longer between grinding than the high-speed cutter in use on this material at the time. This was, without doubt, due to the fact that the cast cutter, the composition and analysis of which were, of course, known, contained a slightly higher percentage of Tungsten than the cutter made from bar stock. The success of these end mills led the writer to go into the matter further and cast other types of tools and milling cutters, on which the aim was not so much the saving of material as the saving of time and labor in finishing.

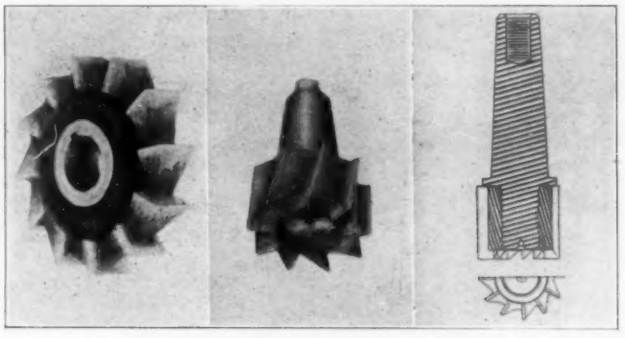


Fig. 4. Cast High-Speed Steel Side Cutting Mill.

Fig. 5. Cast High-Speed Steel End Mill with Carbon Steel Taper Shank.

Fig. 6. Sectional view showing method of casting Cutter onto Shank.

Some of the tools so cast are shown in the accompanying illustration. Figures 1, 2 and 3 show a twist drill, a 3-groove drill and a chucking reamer, respectively, all of a suitable length for use in the turret of a screw machine. These castings, of course, were

molded standing on end on account of the spiral grooves.

The side-milling cutter shown in Figure 4 illustrates another type of cutter particularly suitable to manufacture by this process as the labor cost of this tool if made from bar is comparatively high, on account of the teeth on the sides.

It was found that a side-milling cutter as illustrated in Figure 4 could be cast so that the only finishing necessary was the internal grinding of the hole, the facing of the sides on a surface grinder and the grinding of the cutting edges on a tool and cutter grinding machine. The keyway was cast to the finished size by using a supplementary metal core, inserted into the sand core, making the hole. No heat treatment for hardening was given the cutter after casting. However, subsequent investigation proved that the cutting qualities and the durability of the material could be improved by annealing and afterwards rehardening the castings.

Through this we were enabled to eliminate the larger part of the expensive internal grinding operation by machining the hole and sides of the hub in the lathe leaving about .003 inch for finish grinding after the cutters had been rehardened.

The annealing should be done by packing the castings in a suitable box or crucible filling up the spaces and interstices with sand or some similar material to exclude the air. The temperature should be brought up slowly to about 1450 degrees Fahrenheit and kept at that point until a thorough and uniform heating of the contents of the crucible is assured.

They should be left to cool off slowly (the slower the better) in the box preferably with the furnace after the heat has been shut off.

It is very important that the temperature mentioned, namely, 1450 degrees Fahrenheit, is not exceeded. If the temperature of the contents is raised considerably above this point the purpose of the treatment is in part defeated, as slightly above this temperature the changes which are necessary to make the steel hard begin to take place. The annealing besides making ordinary machine operations possible on the castings has the tendency to make the structure of the metal more uniform, homogeneous and increase the cutting qualities of the steel considerably.

The hardening may be done in an ordinary coke or gas fire by bringing the temperature up to about 2350 degrees Fahrenheit, being careful to get an even heat on the castings and quenching in oil.

Better results are obtained if the castings are packed in a crucible and covered during the heating operation. This will to a certain extent prevent oxidization, and insure a more uniform heating than is possible in an open fire.

A still better method of hardening is by the barium chloride process. The tools are immersed in a bath of melted barium chloride. The temperature of this bath can be regulated within a few degrees and there is no danger of melting down the corners or cutting edges of a tool before the heavier portions of it are sufficiently heated. The tools are immersed completely in the liquid barium chloride during the entire heating operation, consequently there is no oxidization. Of course, a pyrometer is necessary to enable the operator to maintain a uniform temperature of the bath. The length of time the tools should be in liquid depends upon their size and bulk. When withdrawn from the bath the tools are covered with a thin film of the melted barium chloride, which serves to prevent the surface from coming into contact with the air. This feature more than any other gives the barium chloride process its distinctive value. The tools can be quenched in oil without having been exposed to the air from the time the heating began to the immersion into the cooling agent.

The results of the experiments and tests of cast high-speed steel cutters as far as they have been conducted prove that it is not only possible but commercially profitable to cast various types of milling cutters and similar tools in high-speed steel. Of course, it would not be good practice to cast twist drills of standard length, and similar tools, the diameter of which is small in proportion to their length, and which are subject to severe torsional strains in use. Nor would it be advisable to cast end mills, with inserted shanks smaller than 1¾ inches diameter, as the inserted portion of the shank would be too weak for the efficient use of the tool. But after eliminating everything to which the process cannot be applied there remains a very large field in which it will undoubtedly find employment in the near future.

The deciding factor will, of course, be the cost of a tool made by this process as compared with the cost of a similar tool made from bar stock. As far as it has been possible to get at the cost of the cutters and tools produced so far, it can be stated that with limited equipment and facilities the cost of any cutter or tool produced did not exceed one-half the cost of a similar cutter or tool made from bar stock, while in general efficiency they were equal and in some instances ahead of the commercial article.

MAKING AND USING COPPER-MANGANESE ALLOYS

In making copper manganese alloys, the copper is best used in the form of fine pieces, preferably shot, made by pouring melted copper into water, although this necessitates two meltings with corresponding losses of metal, and expense for fuel, labor and crucibles. The alloys will, however, be more homogeneous. The grains are well mixed with charcoal and dry oxide of manganese, and the mixture placed in a pre-warmed crucible, say about 60 pounds for a batch, the crucible being deep enough to enable a thick protective layer of charcoal to be placed in the mixture. The crucible is then brought up to a white glowing heat in a good blast; the result being reduction of the oxide to pure manganese, and allowing of this latter in the nascent state with the copper. It is advisable to supplement the protective action of the charcoal layer by a crucible cover having only a small opening in the center, to permit the exit of the gases of reduction (principally carbonic acid). When the operator judges that the melting is complete and the alloying well under way, the cover is to be removed and the contents of the pot well stirred with an iron rod, to still further assist in the distribution of the two metals between each other. The alloy, when poured, assumes when hard the appearance of good German silver; but it is best not to cast ingots or bars, but to pour directly in the molds; as every time the alloy is melted, some of the manganese is oxidized. Another reason is, that the alloy attacks the crucible quite vigorously.

The most serviceable of the alloys of this series are, according to Claudius, those with from 10 up to 30 per cent. of manganese and 90 down to 70 per cent. of copper, as these have a beautiful white color, are hard, tougher than copper, and may be worked by hammer or rolls. Such alloys without any other admixture may be used to replace copper-tin bronze in many cases; especially where great hardness is not a prime necessity.—Robert Grimshaw.

FOUNDRY PYROMETERS

SOME OBSERVATIONS REGARDING THE USE OF APPARATUS FOR MEASURING HIGH TEMPERATURES IN THE CASTING SHOP AND FOUNDRY.

By H. W. GILLET.

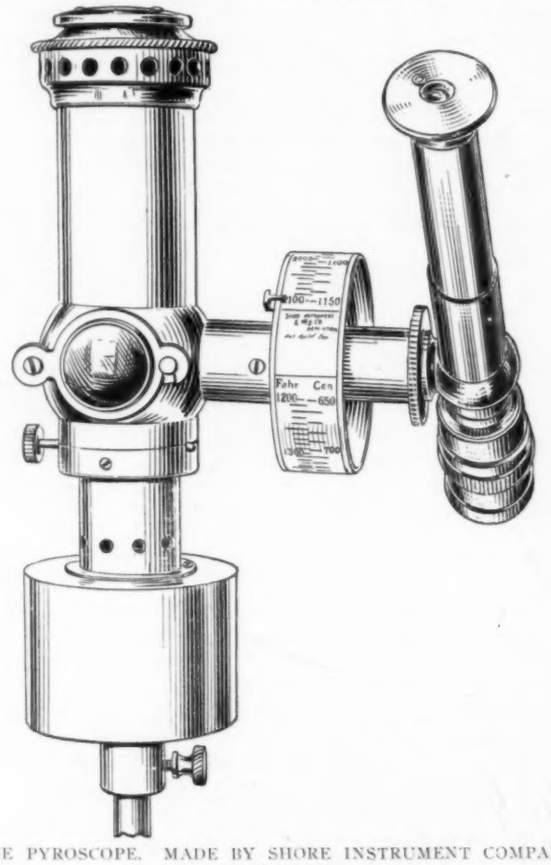
INFLUENCE OF TEMPERATURE ON PHYSICAL CHARACTERISTICS OF MATTER.

There is some definite temperature at which a casting should be poured when made from any particular alloy and from any particular pattern; above or below this temperature a less perfect casting will result. There is also some temperature above which the metal should not be heated in the furnace. Heating the metal too hot wastes fuel, takes time and thus cuts down furnace capacity. It increases oxidation and volatilization losses of valuable metals and the presence of the oxides thus caused may give spongy castings. Pouring too cold gives misruns and blowholes, the latter through the metal solidifying before any air trapped in pouring into the sprue has a chance to escape. Pouring too hot gives rough, dirty and weak castings.

The strength of any alloy is greatly dependent on the size of the crystals that make it up, a fine or close grained metal being stronger than a coarse grained one. There may be alloys in which this does not hold, but if so they are rare exceptions. The fineness of the grain or size of the crystals depends on the speed of crystallization which in turn depends on the rate of cooling. The huge crystals of rock salt deposited by nature in an infinite time are a product of slow crystallization. The finest grades of table salt are produced by rapid chilling of the hot brine, that is, rapid crystallization. Exactly the same principles hold in molten metals. If we pour into a sand mold at a high temperature so that it takes a long time for the metal to freeze, the slow cooling allows large crystals to form. If we pour at a low temperature or into a mold capable of rapidly conducting the heat away, we get rapid cooling, small crystals and a strong casting. On this principle is based the foundry use of chills. In general then we may say that the lowest possible temperature at which any casting can be poured without getting misruns or blowholes is the best. Correspondingly the lowest temperature to which we can heat an alloy, get it well mixed and allow it to be carried to the mold without cooling too far to pour, will be the most economical. This, both through saving in fuel and preventing oxidation and through making it impossible to get too high a pouring temperature.

Since the pouring temperature introduces a variable condition if we are studying any other foundry variable such as changes in the composition of an alloy, different methods of gating, etc., we must hold the temperature constant, otherwise we cannot tell but that variations in temperature may have altered conditions so much as to overbalance the effects of changes in the factors we are trying to study. The problem is then, how to measure and control furnace and pouring temperatures on molten metal. Up to the past few years the foundryman has depended on various physical properties of molten metals which he could judge without any measuring device, such as the amount of zinc fumes given off by brass, the viscocity of the metal when stirred or the brightness of its surface. The last is the most noticeable and the one on which most foundrymen base their estimates of temperature. Luckily the optical brightness increases very rapidly with increasing temperature, that at 2000 degs. Fahr., being nearly two thousand times that at 1000 degs. Fahr.

On alloys of rather high melting point such as brass and bronze, the trained eye can judge temperature fairly well; on low melting alloys such as those on aluminum, this is a different task. Scarcely one man in 500 can pour an aluminum casting by eye alone and not vary his pouring temperature 150 degs. in the course of a week, particularly if dark and light days come in close succession. Such a man will either get many misruns or will pour so far on the hot side that he will get weak castings. Some form of pyrometer that will measure the temperature of molten non-ferrous alloy and which is not so complicated or so delicate that an ordinary workman cannot use it, is a crying need of the non-ferrous foundry. What is the best form of pyrometer for any particular alloy in any particular foundry, is a question depending on the melting point of the alloy used, the type of furnace, the composition of the alloy and all the other conditions.



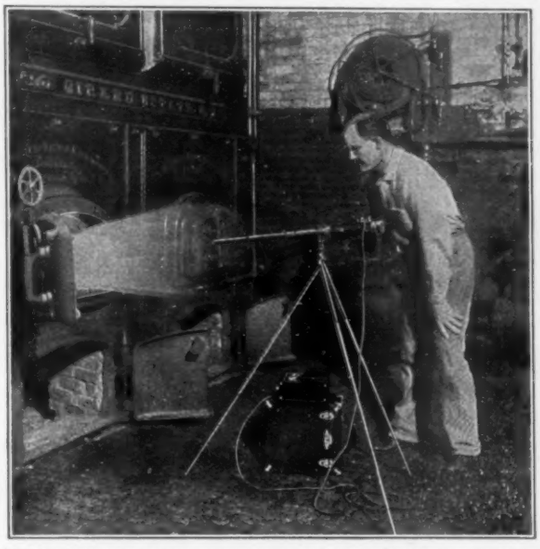
THE PYROSCOPE. MADE BY SHORE INSTRUMENT COMPANY, NEW YORK.

This problem cannot be satisfactorily put up to the pyrometer manufacturer, but must be worked out by the foundrymen with the aid of the pyrometer people. Pyrometer manufacturers have solved the problems of hardening, tempering and annealing steel very well. These deal only with fairly low temperature or with the temperature of heated enclosures and not with molten metals which is the problem of foundry pyrometers and which is far from completely solved. A jobbing foundry handling solders, babbitts, aluminum, brass, bronze, German silver and Monel metal, would be interested in pyrometers to deal with temperatures ranging from 300 to 3000 degs. Fahr. It is safe to say that no one instrument can at present be

found which will satisfactorily handle all these problems. Let us briefly consider some of the different types of devices for the measuring of temperature within this range.

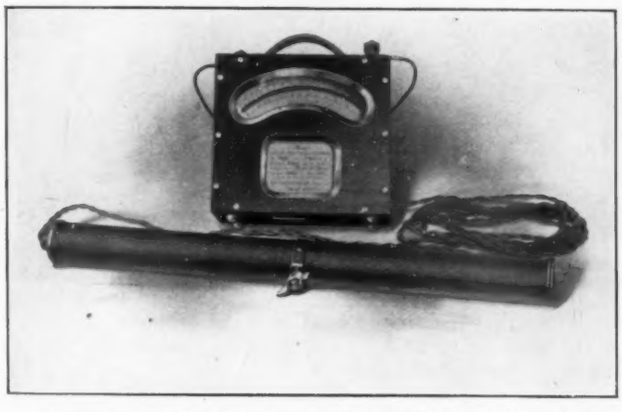
VARIOUS TYPES OF HEAT MEASURING APPARATUS.

Seger cones are small pyramids of chemical mixtures, each having a definite melting point. If a series of these are put in a furnace, some will melt and some will not, the highest melting point of the ones fused showing the maxi-



RADIATION PYROMETER FOR TEMPERATURES UP TO 4,000 DEGS. F. MADE BY BROWN INSTRUMENT COMPANY, PHILADELPHIA, PA.

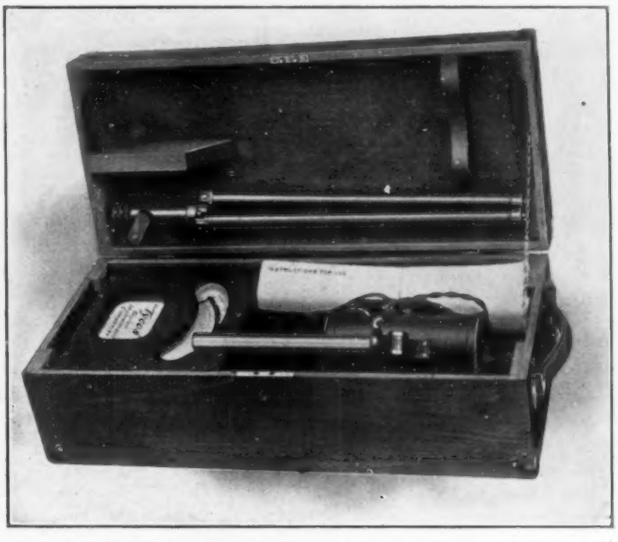
mum temperature reached. These are much used in the ceramic industries but have no value in the foundry. Resistance thermometers depend on the change in electrical resistance of a coil of nickel or platinum wire with changes of temperature. They are very delicate and can be made accurate to 0.001 degs. F. They have to be balanced by a Wheatstone bridge or other device for measuring electrical resistance for each reading and are not easily rigged up to give continuous readings. They are expensive and since they do not retain their calibration well in use at high temperature, there is no foundry problem but is better solved by other types.



FERY PORTABLE OUTFIT. MADE BY TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y.

Expansion pyrometers based on the difference in expansion of a steel tube and a graphite rod with change in temperature might be useful for babbitt and solder. They are seldom very accurate and are not useful above 1000 degs. F. Optical pyrometers utilize the change in brightness of a heated object. The Mesuré & Nouel instrument takes advantage of the rotation of the plane of polarization of light through a quartz wedge, which alters with change in temperature. The instrument will not read below 1300 degs F., and duplicate readings will hardly agree to 100 degs., and while it is of some value in the ceramic trade, it merits no consideration by the foundrymen. The "Pyroscope" and the Le Chatelier optical pyrometer compare the brightness of a hot object with a standard flame such as that of a small kerosene lamp, the intensity of the luminosity of the hot object being cut down by suitable diaphragms. These offer more possibilities. They have no upper limit but are useless below 1300 degs. F.

The Wanner instrument compares the intensity of light of a hot body with a tiny electric lamp which is maintained at constant brightness, the intensity being altered by a polarizing device. This is in actual use on certain types of brass furnaces. The Morse and Holborn Kurlbaum instruments compare the brightness of the filament of a small electric light with that of a hot body, the brightness of the flame being regulated by the current sent through the lamp, the magnitude of this current being a measurement of the temperature. This



FERY PORTABLE OUTFIT IN CARRYING BOX. MADE BY TAYLOR INSTRUMENT COMPANIES, ROCHESTER.

type will work on very small hot bodies or on small streams of molten metal, and it is probably the best type of optical pyrometer for the foundry.

Radiation pyrometers are of two types, focusing and non-focusing, the Fery being of the first and the Tycos, Brown and Thwing of the second. Any hot body gives out heat to its surroundings, the hotter, the more heat given out. Some of this radiant energy is visible and some invisible; most being invisible. This invisible radiation can be reflected by a mirror or refracted by a lens. If it is thus centered on any heat sensitive device, we can obtain an indication of the temperature of the hot body. The heat sensitive device used in all radiation pyrometers is a tiny and delicate thermo couple and after the radiant energy has thus been centered on the thermo couple, the instrument becomes in effect one of the thermo electric type.

(To be continued.)

QUICKSILVER PRODUCTION.

Revised figures show a total output of quicksilver in the United States for 1911 of 21,256 flasks.

LARGE PUMPS OF ACID RESISTING METAL

A Description of the Molding and Casting of Parts of a System for Pumping Sulphur Waters.

By W. J. Reardon.*

Having been asked to prepare an article for The Metal Industry, and in view of the fact that most all readers of The Metal Industry are practical men, I decided to present a description of molding and pouring a large pump for a condenser to be used in sulphur water, and made from acid resistance metal, might be of interest to foundrymen. The size of the casting can readily be estimated by comparing the mold with the cope portion of the flask, as against the men shown beside it, as shown in Fig. No. 1.

W. J. REARDON.

The amount of metal required to pour the casting was 10,000 pounds, the casting weighing 7,800 pounds when cleaned and ready for shipment. All the metal was melted in an open flame furnace, and was was composed of the following mixture: 76 copper, 14 lead, 8½ tin and 1½ zinc, an analysis of the metal in the casting was made which showed as follows: 76.13 copper, 14.02 lead, 8.43 tin and 1.42 zinc. I might mention that this casting had to stand a water pressure of 200 pounds to the square inch.

The first step in the process of the molding was the consideration of our cores. By referring to Figs. 1 and 2 you will readily agree with me that the casting required a large number of very intricate cores. The selection of the materials, such as core sand and binder and core arbors, were an important factor in the success of our work, after which we were confronted with the fact that our core ovens were too small to dry the cores, necessitating making the cores in an iron foundry seven miles distant from the brass foundry. The cores were conveyed in a flat railroad car and then taken to the brass foundry on the top floor, the foundry building being three stories high, and it need not be mentioned regarding same, other than that carefulness was the main point in our favor in being able to see the cores safely in the foundry.

FIG. 1. MOLD FOR THE LARGE PUMP CASTING. OPEN, SHOWING COPE RAISED IN THE AIR.

The plans were carefully gone over regarding the method we would use in the making of the mold, and as it is the case sometimes to practice economy, I figured that should I perhaps spend a few dollars extra to decrease the possibility of getting a bad casting, that it would be money well spent rather than have to make another casting. It is an easy matter to make the second casting good after the first casting has been lost, due to not taking every possible precaution to insure against any controllable errors. Furthermore, the money that would be lost would be too high to charge to our experiment account. It was decided that we would make the mold in green sand, skin dried; the sand used was No. 2 Albany mixed half and half with a sharp open sand and tempered with clay wash and two parts No. 190 "Cantbebeat," or 98 parts sand and 2 parts "Cantbebeat," this mixture making a very strong and efficient sand and skin dried very quickly. No. 702 silver lead mixed with molasses water was used to blacken the mold. In addition to the casting that is shown in Figs. 1 and 2, there was a cap which is shown in Fig. 3, which went with it. This casting, weighing 3,500 pounds, cleaned up as it left the mold, and we figured the best possible material we could use would be the cheapest for us in the end should our work result in a good casting, and at this time I can add to that statement by advising that one mold only was made and the casting is now in use.

We are all not called upon to produce a complicated casting every day, and as hard as it may seem to us at first, our experience is usually broadened somewhat after we have gone to work and solved the unusual problem which seemed to confront us, and I venture the assertion that cases of this kind is what prompts us to have the ability and faith to tackle still larger problems. A study of every detail is absolutely necessary before starting, and I can well remember the lesson I received when a boy. I was given a problem in arithmetic, and at a glance I knew it was a hard one. My brain capacity was entirely used up in the thought that this problem was a hard one, leaving no thought to the consideration of the answer, naturally being up in the air, I was stuck. But upon being informed that if I should read over the problem carefully, study each word and figure carefully, forgetting for a moment that the problem was hard, that I might be able to arrive at the answer, all of which I did, working and figuring it out, step by step. After one step being accomplished and understood, the next one began to appear to me, making it much easier to complete, and so it is with us all, every detail commands study and not merely skimming over. However, it is a fact that many castings are

*Foreman Brass Foundry, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

lost because the material that is used is not adaptable for the work. The material used as well as the methods employed should be carefully studied as to the part they will play in producing a good casting. The opinion that some people have that there are secrets in the foundry is all wrong, as everything that happens resulting in a bad casting, is due entirely to the fact that something was overlooked and neglected.

In these days of keen competition it is very essential

FIG. 2. THE FINISHED CASTING, SHOWING THE INTRICATE CORE SYSTEM.

that the manufacturer operate his foundry on the best modern methods, and it is useless to go into details of the fact that there is a right and wrong way of doing it. We are all aware that both the right and wrong ways have been used, the latter method until recently seeming to have the preference. The requirements of a brass foundry today call for much more study than a few years ago, and in order to be successful we must improve and advance with our work, in keeping with the rapid pace that is being constantly set before us along all lines of improved apparatus. To be able to keep abreast of the times we should have, or acquire, a certain knowledge of metallurgy. A most essential point, in fact, enabing us to know and realize the cause of conditions that may confront us, and in addition be able to work out seemingly unknown propositions, so that when all is put together they will result in what we are all striving for, namely, good castings.

Properties of alloys, such as casting temperature, rate of cooling and heat treatments, must be known to be successful and enable one to arrive at a certain factor, yet the predominating factor is the gating and the placing of the risers for certain kinds of castings of different designs. We have found in a casting of this kind that it is always the best practice to cover the risers so as to prevent a rush of air through the mold.

The fact that this casting was out of the ordinary class of castings that are handled daily prompted everybody to be interested and, as previously mentioned, gave everybody a chance to think more deeply; even to the man whose duty it was to lift the sand to the molder. A deep interest was shown by everyone until the casting was machined and all tests were made, resulting in giving all that was asked for. The result also proves the efficiency of the oil melting open frame furnace in melting metal to stand a high water pressure.

COLORS OF COPPER-ZINC ALLOYS.

Those who have been deceived in buying brass cocks and valves of a nice deep rich color, in the belief that they were suited for use in high-pressure steam, and have discovered that the color was due to

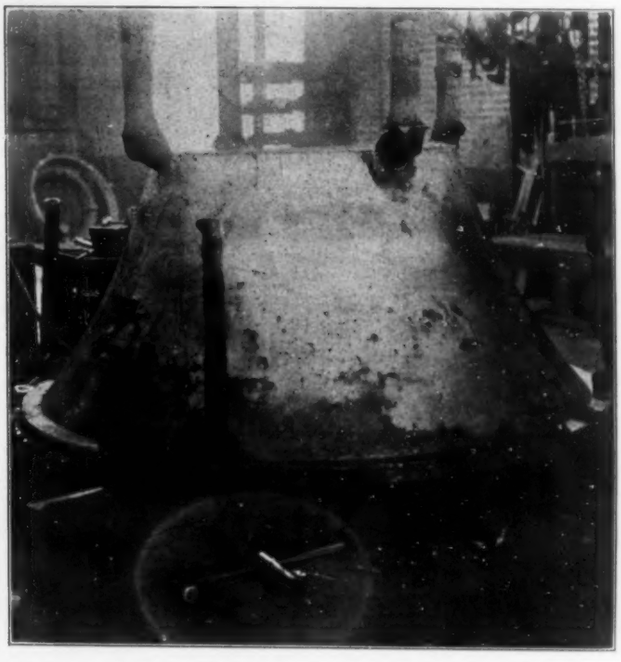


FIG. 3. THE FINISHED CASTING OF THE CAP FOR CASTING SHOWN IN FIG. 2.

lead, have enriched their experience at the cost of their pocketbook (or perhaps of that of some one else). But very often it is desirable for a perfecly legitimate purpose, as for instance matching castings already made, to secure a certain color; and the following table will aid in this, as well as partly help in judging of the quality of the alloy already made (if it has not been pickled).

Per Cent. Copper.	Zinc.	Color.
95	5	copper red
90	10	red brown
84	16	red yellow
80	20	reddish yellow
78	22	" "
75	25	bright yellow
70	30	yellow
65	35	deep yellow
62	38	" "
59	41	reddish white
50	50	golden yellow
40	60	"bismuth gray"; very brilliant
30	70	"antimony gray"
20	80	"zinc gray"
10	90	" "

ROBERT GRIMSHAW.

THE RELATION OF CHEMISTRY TO ELECTRO-PLATING*

By Chas. F. Burgess.†

C. F. BURGESS.

Sixteen years ago the University of Wisconsin installed an electro-plating laboratory, and thus secured the reward of being the first university in this country to offer a course of instruction in the electro-deposition of metals. The writer was assigned to the care of this laboratory and continued in charge of it for about ten years until succeeded by Dr. O. P. Watts. No play-ground can afford more entertaining recreation, no workshop can afford more absorbing employment, and no exploration trip can furnish more obstacles and disappointments than can be found in a laboratory of this kind by one who finds pleasure in electro-chemical research. Joy and trouble followed each other in rapid succession beginning with my first experience in this line. Having secured an appropriation, an equipment was ordered, including eight forty-gallon finely enameled iron tanks. These were installed in a room over a machine shop. Following book instructions, I made up a nickel bath and a copper bath, going home at night to dream of the beautiful metal deposits I should secure the next day. On arriving early in the morning, I was met at the door by the Professor of Shop Practice who conducted me to a place directly below my laboratory and exhibited a brand new $1,500 milling machine beautifully coated with copper. Investigation forced me to come to the following conclusions:

"Enamel lined tanks are to be considered with suspicion as regards their ability to hold a copper sulphate solution."

"Iron replaces copper by simple immersion, and that quite rapidly."

"A copper coating obtained from a sulphate solution does not enhance the value of a milling machine."

"It is desirable to have and use some knowledge of chemistry to get satisfactory results in electro-plating."

From this experience you will all conclude that I was decidedly an amateur in the profession I chose to follow—to which charge I will readily plead guilty; and although I have had sixteen years of study and experience, I still feel decidedly amateurish in rising to speak to an audience of men skilled in the art of electro-deposition of metals.

Since electro-plating is a part of the field of applied chemistry, there is no difficulty in proving a parental relationship of chemistry to electro-plating. The theme I wish to dwell upon is that in spite of this relationship there is not a sufficient intimacy between chemistry and electro-plating, between the scientific and the practical man, between the college laboratories and the factory plating rooms, and that anything which we can do to foster this intimacy will result in mutual benefit. About eleven years ago I was one of a group of men gathered in Philadelphia to organize the American Electro-chemical Society. About one hundred attended this first meeting of a society which has since grown to a membership of above 1,200, of a society which has taken its place among the important engineering and scientific organizations in this country. In looking over this membership list there is one fact which is not particularly gratifying. That is, there is a very small proportion of practical electro-platers, of men who are certainly electro-chemists in the true sense of the term as far as it means those who are contributing to electro-chemical progress.

A peculiar fact and one for which I have been trying to find some reason is that the average business or working man knows less of chemistry than he does of physics. Chemistry is probably taught to as many students in our colleges as to those enrolled in the classes of physics, yet the average man in later years retains more of his physics training than he does of his chemical instruction. It is argued that physical phenomena touch our everyday life more than do the chemical; others argue that chemistry is more abstruse and less easily understood. With both of these views the writer takes exception. He believes that one reason for this difference is the unfamiliar language which the chemist uses in talking and writing. He uses shorthand expressions in the way of formulæ and equations to express chemical reactions which are confusing to the man who has not paid particular attention to this subject. As a matter of fact, chemistry is an easy subject. It is comparatively free from mathematics. We do not need to work in a school laboratory to get practice in what we are studying, for we are all working unconsciously in a chemical laboratory day and night, no matter what our occupation, and no matter what our location.

The text book on chemistry devotes, for example, a chapter to oxygen, an element of the air which we breathe, the element which introduced into our furnaces unites with fuel to liberate heat, and produces other gases, carbon-dioxide and carbon-monoxide, the relative amount depending upon the rate at which air is supplied. When put in the form of a chemical equation we are told that twelve grams of carbon will unite with 32 grams of oxygen to form 44 grams of carbon-dioxide. The fireman of a boiler plant puts this equation in a different form. He knows that a certain quantity of air is necessary to get the best results from the combustion of a certain quantity of fuel. He does not use a balance or a burette, but depends upon the cruder and more practical instruments, the shovel and the draft gauge. Since the process of living depends upon breathing and the chemical changes which that supports, we might say that chemistry becomes a living matter with all of us.

In studying our text book still further we come to another chapter on "water," and we find it abbreviated as H_2O, indicating that it is made up of hydrogen and oxygen, a fact with which every electro-plater is acquainted, because he has observed these gases coming off through electrolysis. We do not need to be a chemist to know a good deal about water; to know that it is a good solvent; that it has certain properties which render it suitable for drinking purposes; that certain organic compounds added to it may profoundly influence its effects which furnish a strong plank in the platform of the Prohibition party. The kitchen of the Hotel Morrison is a chemical laboratory where a great variety of reactions take place and without a knowledge of chemical formulæ being necessary. The electro-plater is an electro-chemist working in a laboratory where an abundance of chemical reactions are

*Paper presented before Chicago Branch, National Electro-Platers' Association, Chicago, Ill., December 14, 1912.

†Professor of Chemical Engineering, University of Wisconsin.

going on, reactions which bring a livelihood and which contribute to the world's material progress. I am a strong believer in the statement that a good electro-plater is just as good a chemist as is the chemical analyst who knows little about the electro-deposition of metals. Mrs. Morrison, who cooked the dinner which we have just had, is as good a chemist as far as results are concerned as is the food chemist who analyzes the materials which we eat but who knows nothing about cooking.

I do not mean to imply any reproach to the analyst for not knowing how to plate nickel, nor to the food chemist for not knowing how to bake bread; neither should the plater or the cook be taken to task for lack of knowledge of chemical formulæ for there are limitations on what any of us can know. But both classes of men, the practical and the theoretical, can each help the other if they can get together. There is a vast literature on chemistry, much of which has been written by the scientific and so-called theoretical men, and much of which can be of use to the applied chemist, the electrotyper and the electro-plater, if he will read and study it.

"There is nothing new under the sun" is an old saying which is almost one hundred per cent. truth. On the other hand there are a lot of new combinations of old things being worked out every day, combinations which go to make up the world's progress. The chemical properties of tungsten have been known for a long time; and the physical properties of the glass globe from which the air has been drawn has determined its use for many years for incandescent lamps, but when a filament of tungsten was placed in this bulb and the current turned on there was produced this wonderful new efficient light, the tungsten lamp. Chemists have known for a century that black sulphide of silver can be reduced to metal silver by hydrogen. Among the earliest observations of the electro-plater was the fact that hydrogen can be deposited on a cathode by running a current through certain solutions, but it is only recently that a silver cleaning pan has been worked out whereby the tarnished silver is immersed in a solution of salt and soda, electrical current is generated by the zinc of the pan which deposits hydrogen on the silver and thus removes the tarnish almost instantaneously. A simple combination of two simple long known phenomena has resulted in a valuable device which is now used in hundreds of thousands of kitchens.

A valuable lot of work which the chemist has done for the electro-plater is his study of the solubility of various materials in water. From solubility tables much information is obtainable by the man seeking to work out new plating, or metal coloring or cleaning baths. The chemist is also studying the solubility of materials in solvents other than water, work which is of particular value; for the writer believes that a magnificent field of opportunity lies open to electro-platers in using electrolytes which contain no water; electrolytes which hold forth the possibility of giving good deposits of aluminum, of chromium, and other useful metals not obtainable with water solutions. Perhaps from these electrolytes we can get better deposits of zinc, lead, copper, platinum, and the like, than we can get with our present methods. My colleague, Dr. Watts, has made an interesting discovery of the fact that a fine adherent coat of copper can be deposited upon iron from a solution of copper nitrate in water-free alcohol. There are certain practical objections to the use of this process, but it lies with the practical man to help to overcome some of these difficulties.

THE SILVER SOLUTION

By S. Shoeld,* Ch. E., and G. B. Hogaboom.†

The more simple an electro-plating solution is in its composition, the easier it is to operate and to keep in a good working condition. Solutions that contain several chemical salts that are supposed to increase the conductivity are often failures. They are easily unbalanced and when out of order are difficult to restore. The chemical needed can be determined only by a complete analysis of the solution. The knowledge of how to do this is unfortunately not possessed by every plater and the operating of a solution becomes merely a matter of chance. Experience, naturally, lessens the hazard, but many a time the most experienced fails in his guess. The plater should know the composition of every chemical salt that is added to a bath and its influence upon the structure of the deposit. He should know in what proportion the metal and the chemicals needed to replenish the bath are to be added. In complex solutions or those made from salts of unknown composition this is a difficult matter. It is far better to use a solution which you can thoroughly master than one which requires much attention.

Every plating solution has run the gauntlet of all the chemicals that could be added without entirely destroying it. The silver solution has been no exception, but after three-quarters of a century the simple one composed of either the chloride or the cyanide of silver and cyanide of potassium has been found to meet all the requirements to almost perfection. The question of using the chloride or the cyanide of silver is only one of whether the presence of the alkali chloride that occurs when the chloride of silver is used is detrimental to the bath. Another remarkable feature of the silver solution is the condition of the bath, in relation to the relative proportions of the metal and the cyanide, from which a deposit can be obtained. It is probably one of the most abused solutions and fairly good results can be had under seemingly any condition. It is like most things that are easily managed, they are often the most neglected. To illustrate, below is given the analyses of two solutions that were being used:

To each gallon.	No. 1.	No. 2.
Silver	⅛ oz.	2⅘ oz.
Free cyanide	1⅗ "	16⅔ "
Carbonate of potassium	5⅓ "	17½ "

The first one was used for light deposits and the only trouble complained about was "that the solution did not plate as fast as it use to." These solutions are, of course, abnormal, but the contrast serves to show to what limits a solution can be used. The result from neither could be as satisfactory as that from a bath kept more within the proper limits.

Definite laws control the deposition of metal from solution. The deposition of silver from a cyanide solution on the cathode is a secondary reaction. This is the reason why the plated surface becomes smooth. If, for instance, one would try to deposit silver primarily from a solution containing silver-ions, such as silver nitrate or a sulphate solution, the plated surface would be coarse and crystalline in structure. The reason is that the silver has a tendency to precipitate out on the silver particles already deposited and not evenly all over the cathode surface. In a cyanide solution there are no silver-ions in free state. The positive potassium-ions when coming in contact with the cathode goes over into a molecular state and reduces the silver from the solution. The silver is deposited just

*Berkel Chemical Company, Jersey City, N. J.
†Instructor in Electro-plating, Newark (N. J.) Technical School.

on the places where the primarily deposited potassium was. The primarily deposited potassium has no reason to deposit on the places where the silver was before, and hence the deposit of silver will be even and smooth. The reactions in a bath during the deposition are:

$$\underset{\text{Cathode}}{-} \qquad \underset{\text{Anode}}{+}$$

$$K\ Ag\ (CN)_2$$

$$K + K\ Ag\ (CN)_2 = Ag \quad Ag\ (CN)_2 + Ag + 2\ KCN \qquad KCN = 2\ K\ Ag\ (CN)_2$$

It can be readily seen from this why there should always be an excess of cyanide in a solution. With no free cyanide the silver would not dissolve from the anode.

A silver solution should contain only a pure alkali-silver-cyanide, with the necessary amount of excess alkali-cyanide. The alkaline metal may be potassium or sodium, that is, either the cyanide of potassium or of sodium. The potassium cyanide has a stronger positive ion than the sodium cyanide and therefore the conductivity of it is higher than that of the sodium cyanide. For this reason potassium-silver-cyanide should be preferred. Mixtures containing both the alkali cyanides may be used, but are less advantageous to use than pure potassium cyanide. The life of a bath made from the double cyanide of silver and potassium is longer than one made from any other silver salt. No useless chemical salt that will be inert in the solution is added. More uniform results are to be had as the bath is easily kept in a good condition. The resistance is at its lowest point, in relation to the specific gravity and the amount of metal, and hence the metal can be more readily and regularly deposited. In replenishing the same silver salt, potassium-silver-cyanide, in a concentrated solution, can be added and the free cyanide that has been decomposed restored by the addition of potassium cyanide. The only thing needed to bring the solution back to its original state is to remove the carbonate which has been formed by the action of the carbon dioxide of the air. This can be done readily with the cyanide of barium.

The chloride of silver can be used for making a solution, in fact, it is still extensively used, but is gradually being displaced by the cyanide of silver. If the silver chloride is used it is dissolved directly in a solution of potassium cyanide which forms potassium-silver-cyanide and potassium chloride. The bath will thus contain a considerable amount of the alkali-chloride. This tends to decrease the efficiency and the life of the bath. The amount of free cyanide must be higher in a solution of this kind than in a double cyanide of silver solution. The reason seems to be that it partly covers up the action of the chloride in the bath. The specific gravity of the solution is increased by the presence of the chloride of potassium and unless taken into consideration will deceive the plater if he depends upon the Baumé scale reading for the condition of his bath. The following table shows how the potassium chloride acts.

Silver.	Potassium Chloride.	Increase of Specific Gravity.
1 oz. per gallon	.7	.8° Baumé
2 " " "	1.4	1.6° "
3 " " "	2.1	2.5° "
4 " " "	2.8	3.3° "
5 " " "	3.5	4.2° "
6 " " "	4.1	4.9° "

The conductivity of the solution program-molecule will also decrease and if the pressure of 3 volts or more ever be used the chlorine will be released at the anode and attack the anode hooks if they are made of iron.

Very few platers are using nitrate of silver in their plating solutions. The potassium nitrate which is formed is a source of constant trouble and the life of the bath will be very limited. In heavy solutions the action of the nitrate is more pronounced than in solutions of lower gravity. After the addition of nitrate of silver to the bath the deposit, for often a whole day, will be very coarse and brittle, so much so that if silver deposit work is being done the deposit often leaves the glass and breaks when being polished. In fact, a small addition of nitrate to a pure cyanide of potassium bath will immediately make the deposit rough and hard and not at all tractable to the burnisher.

The equations for the foregoing solutions are: Formation, of silver nitrate, $3\ Ag + 4\ HNO_3 = 3\ Ag\ NO_3 + 2\ H_2O + NO$; of silver cyanide, single cyanide of silver, $Ag\ NO_3 + KCN = Ag\ CN + KNO_3$. The potassium nitrate to be washed out thoroughly. Of the potassium-silver-cyanide, double cyanide of silver, $Ag\ CN + KCN = K\ Ag\ (CN)_2$. If the chloride of silver is to be made, $Ag\ NO_3 + Na\ Cl = Ag\ Cl + Na\ NO_3$. The sodium nitrate to be thoroughly washed out. To put the chloride of silver in solution, $Ag\ Cl + 2\ KCN = K\ Ag\ (CN)_2 + K\ Cl$. The potassium chloride remains in solution. If nitrate of silver is used in the bath, $Ag\ NO_3 + 2\ KCN = K\ Ag\ (CN)_2 + KNO_3$. The potassium nitrate remains in solution.

The same amount of potassium cyanide is required to put either the chloride or the nitrate of silver into solution, as it does to make the double cyanide of silver and potassium. In adding the single cyanide of silver to the bath to replenish it only one-half the amount of the cyanide in the solution is required to take it up, as it does if either the chloride or the nitrate is used.

MAKING A SOLUTION.

When making a silver plating solution the silver cyanide should be made first and then dissolved in a potassium cyanide solution. The silver cyanide is made preferably out of silver nitrate. This can be purchased or made. The amount of fine silver and nitric acid that is used are according to the following table:

TABLE NO. 1.

	Nitric Acid. Baumé			
Silver	36 Degs.	38 Degs.	40 Degs.	42 Degs.
1—Parts by weight	1.5	1.4	1.3	1.2
2— " " "	3.0	2.8	2.5	2.3
3— " " "	4.4	4.1	3.8	3.5
4— " " "	5.9	5.5	5.0	4.6
5— " " "	7.4	6.8	6.3	5.7
6— " " "	8.9	8.2	7.5	6.9
7— " " "	10.3	9.6	8.8	8.0
8— " " "	11.8	10.9	10.0	9.2
9— " " "	13.3	12.3	11.3	10.3
10— " " "	14.7	13.6	12.5	11.4

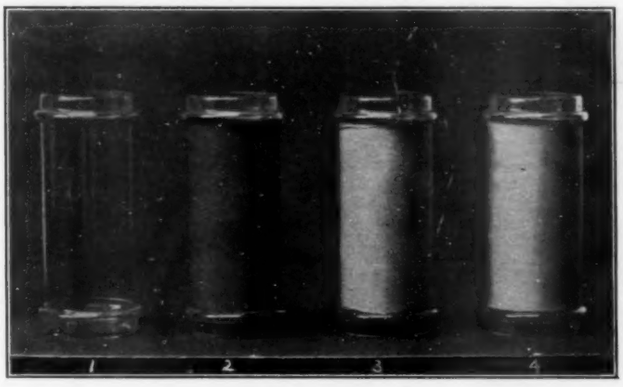
If necessary a slight amount of excess of nitric acid should be used that all the silver will be dissolved. The solution, if acid, should be made neutral with soda ash. No precipitate should be allowed to form and, if formed, just dissolved in nitric acid again. The silver is now precipitated out of this solution as silver cyanide with potassium cyanide. The proper amount of potassium cyanide is dissolved in water and added to the neutral nitrate of silver solution gradually while vigorously stirring. This complete operation should be made where there is good ventilation, preferably in the open air, on account of the disagreeable fumes.

(To be continued.)

A METHOD OF SILVER PLATING GLASS TUBES AND THEIR USE

By G. Elmer Moreland.*

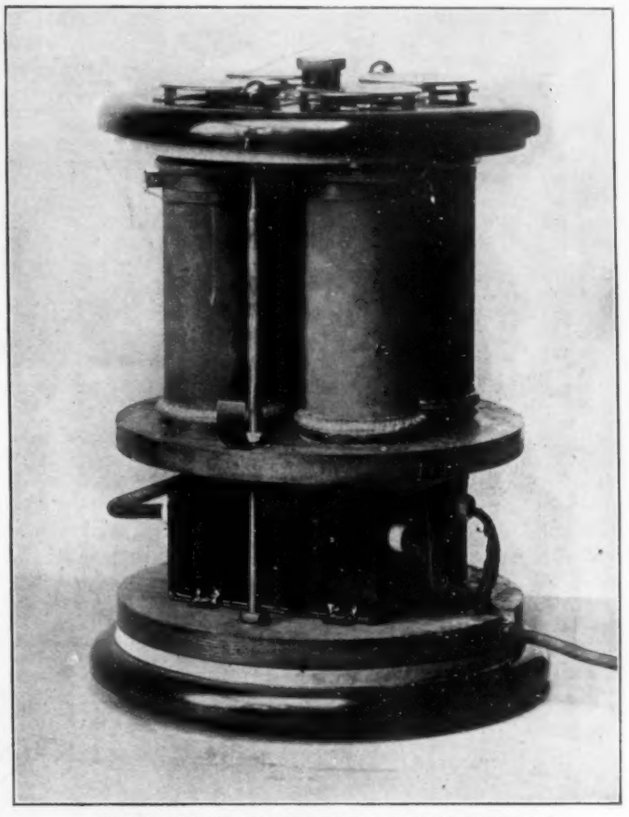
The electro-deposition of a metal coat upon glass tubes or any non-conducting materials has been in actual practice for many years. All that is necessary is to render the surface of the non-metallic articles so that it will conduct a current of electricity. In preparing glass tubes for electro-deposition it is only necessary to spray the tubes with one (1) coat of the following mixture: 1 pound of copper plating bronze added to 1 gallon of lacquer. Tubes can be wired and strung in plating bath 15 minutes after they have been sprayed, and the deposit will form immediately. Any desired thickness can be deposited, depending on the length of time tubes are run in the plating bath. A coat of .003 can be deposited in less than one hour. This is a very quick process and the deposit is as smooth as the glass itself. There are other methods of treating glass for electro-deposition but they are slower, more expensive and the deposit is rough. The following cut shows glass ozonizer tubes before and after plating.



No. 1 is the glass tube before it is sprayed with bronze.
No. 2 shows the bronze coating which was sprayed on in 15 seconds; the tube is now ready for the plating bath.
No. 3 shows the tube as it comes from the bath and the manner in which it is strung on wire.
No. 4 shows the tube with wire removed and ready for use.

THE OZONIZER IN ITS FINISHED CONDITION.

The solution used by the writer for plating is known as the acid copper solution, and is made by dissolving 1½ pounds of copper sulphate to the gallon of water, and then adding 4 ounces oil of vitriol. Use from two to three volts. The solution, when made according to these proportions, should stand about 16 degs. Baumé. After the sulphuric acid has been added, the solution will stand about 20 degs. Baumé. The solution is used cold, and as copper is deposited very rapidly it is necessary to agitate the solution to get best results. The simplest way to agitate it is to run a lead pipe down into the solution and blow air through it.



THE OZONIZER IN PROCESS OF CONSTRUCTION.

The glass tubes shown in the illustration are used in an ozonizer. Although considerable has been written regarding ozone and ozonizers, the apparatus is so comparatively new that a word of explanation may not be out of place. As the name implies, it is a device for generating ozone, thus "ozonizing" the air passing through. Ozone is a form of oxygen in a highly active state, made so by an electrical discharge called a "silent brush discharge," which in reality is like a minute lightning discharge without the thunder. The oxygen of the air, passing over this discharge, undergoes a molecular change whereby three atoms are assembled in the place of two. The chemist symbolizes oxygen as O_2 and ozone as O_3. In this state the atoms of oxygen are somewhat unstable and highly active, and ready to unite with any oxidizable substance with great vigor. It is much more active than oxygen itself, and is therefore the strongest known oxidizing agent. As all forms of germs and various waste matter impurities suspended in the air, and water consists of easily

*Foreman Plater, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

oxidizable substances—usually carbon—the ozone acts very strongly as a germ destroyer and deodorizer by destroying them by the process of oxidation. The ozonizer in which the above described tubes are used is shown in the illustration, and is designed for use in rooms of ordinary size, such as offices and dwellings, to sterilize or deodorize the air, or for the beneficial effects of breathing the ozonized air which is claimed to be beneficial in some forms of throat and lung diseases. It can be attached to an ordinary lamp socket and left running indefinitely, as the power consumed is very small, being only eighteen watts.

FACTORS INFLUENCING THE NATURE OF ELECTROLYTIC DEPOSITS*

By Oliver P. Watts.†

Any professional plater or electro-refiner of metals should consider himself fortunate if he has not acquired an extensive personal acquaintance with the numerous disagreeable forms in which metals may be deposited, forms other than that smooth, solid, tough and adherent coating which is the plater's triumph and delight. Metal deposits may be smooth, rough, mossy, spongy, powdery, tree-like, discolored, brittle, curly, and non-adherent—you know several or all of these forms. Among the many factors which determine the nature of electrolytic deposits are the following:

OLIVER P. WATTS.

1. The metal deposited.
2. The metal receiving the deposit.
3. The chemical composition of the electrolyte.
4. Gases dissolved in or evolved from the electrolyte.
5. Insoluble impurities.
6. Temperature.
7. Current density.
8. Concentration and circulation of the electrolyte.
9. Thickness of the deposit.
10. Extent of anode surface and arrangement of anodes.

That certain metals have a characteristic form of deposit, is illustrated by the spangles in which lead plates out of a solution of its nitrate (slide No. 1) or acetate, and the needles which silver forms from the nitrate solution. Such deposits are of no value to the plater, and useless to the refiner, except in the case of a metal like silver, which does not oxidize. Slide 2 shows little tufts of mossy zinc upon a plate otherwise good. Slide 3 is a case of treeing of zinc, aggravated by the use of an anode much larger than the cathode. Slide 4 is a view of a ploughed field in northern Wisconsin, surrounded by a stump fence with a few bushes growing up through the fence. My only excuse for presenting this foreign scene to members of the National Electro-Platers' Association is that it is a photograph of zinc as plated from a solution of zinc bromide. Slide 5 shows the well-known tendency of nickel to curl, when it loosens from the underlying metal.

That the metal receiving the deposit is a factor of importance is illustrated by the poor adhesion of electroplate upon aluminum, and of nickel plate upon nickel. These metals seem, ordinarily, to be covered with an invisible film, probably of oxide, which prevents that perfect contact of the two metals which is essential for good adhesion. An adherent copper deposit from the acid sulphate bath cannot be obtained on iron or zinc, as it can on brass, copper, lead, silver, carbon, platinum, etc. When plating copper or brass with silver the quicking solution is used to change the nature of the basic metal by alloying it with mercury. Slide 6 shows the reason for the exceptional way in which some metals receive a plate of another metal. When two different metals, e. g., copper and zinc, are dipped into an electrolyte, like dilute sulphuric acid, a voltaic cell results, having an electromotive force of a particular number of volts.

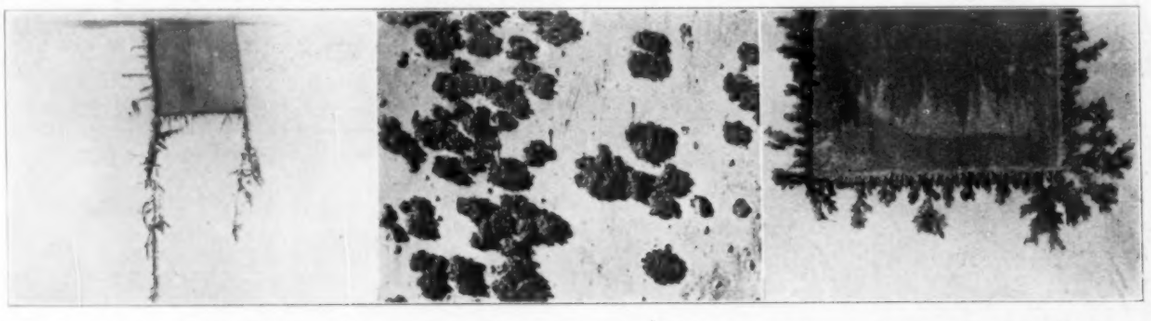


FIG. 1. LEAD DEPOSITED FROM SOLUTION OF LEAD NITRATE.

FIG. 2. ZINC DEPOSITED FROM A NEUTRAL SOLUTION OF ZINC SULPHATE.

FIG. 3. THE "TREEING" OF ZINC.

The table is arranged to show the electromotive force between any two metals in several different electrolytes. While the voltage depends mainly upon the particular metals and the electrolyte chosen, the temperature and strength of the solution have a little effect upon the voltage. The voltaic cell consisting of zinc and copper in dilute sulphuric acid is known to have an electromotive force of about one volt. The voltage is calculated from the table by starting at the potential of zinc in sulphate solution, + 0.52 and going down the scale, to that of copper, which lies 1.03 volts away from zinc. In this cell the zinc dissolves or is corroded, and in so doing displaces hydrogen from the acid, and causes it to plate out

*Paper presented before Chicago Branch, National Electro-Platers' Association, Chicago, Ill., December 14, 1912.

†Director of Electro-Plating, Laboratory of University of Wisconsin.

on the copper cathode. From the table it is seen that iron and copper in a solution of copper sulphate should form a voltaic cell with an electromotive force of 0.60 volts. Since iron, like the zinc, is above copper in the series, it must be the anode and dissolve, and by dissolving cause copper to plate out on the cathode—all of which happens. Iron decomposes sulphuric acid, H_2SO_4, by taking the place of the hydrogen—or, as we usually express it, sulphuric aced, corrodes iron, and the hydrogen plates out on the iron. Similarly a solution of copper sulphate, $CuSO_4$, corrodes iron, and the displaced copper plates out on the iron. Since copper can be deposited only by the dissolving of some of the iron on which the copper coating rests, it is evident that plating by the mere immersion of one metal in the salt of another metal cannot give a perfect or thoroughly adherent coating. A metal that is positive to another by several tenths of a volt will receive a coating of the second metal by immersion, unless the first metal forms an insoluble compound with the particular solution used, or is protected by a film of oxide, as is the case of aluminum. Solutions of the salts of the precious metals are readily decomposed by the other metals. It is on the same principle that zinc, copper, brass, etc., are amalgamated by dipping into a mercury solution.

SLIDE NO. 6.

SINGLE POTENTIALS.

	Neumann		Caspari		Students
	Sulphate.	Chloride.	Hydrogen.		Cyanide.
Aluminum	+1.04	+1.01	—	Zinc	+.94
Zinc	.52	.50	+.37	Aluminum ...	.79
Cadmium	.16	.17	+.15	Copper	.77
Iron	+.09	+.09	—	Cadmium	.64
Nickel	—.02	—.02	—.12	Copper, amal.	.58
Tin	—	—.08	+.20	Tin	.45
Lead	—	—.09	+.31	Gold	.33
Copper	—.51	—	—.10	Silver	.29
Mercury	—.98	—	+.45	Nickel	.27
Silver	—.97	—	—.18	Lead	+.15
Platinum	—	—1.14	—.24	Iron	—.12
Gold	—	—1.36	—.31	Platinum	—.25
Platinum black	—	—	—.33	Mercury	—.49

It has been stated that the potentials of the metals depend for one thing on the electrolyte; yet for solutions of sulphates, nitrates, chlorides, and acetates the potential of any particular metal undergoes but slight changes. In several electrolytes, notably the cyanides, the changes of potential are marked, and the usual order is greatly changed. Iron in the cyanide solution is below copper, gold and silver; and therefore it should not receive a coating of these metals when immersed in their cyanide solutions. Hence the use of the cyanide copper bath for plating on iron.

A glance at the list of potentials in cyanide shows the theory of the quicking dip for articles to be silvered. The potential of copper is so much above that of silver that it is corroded by the silver plating bath and silver is deposited upon the copper. By amalgamating, the potential of the copper is brought much nearer to that of silver and the harmful deposition by immersion is greatly lessened, resulting in improved adhesion of the silver plate. The great influence of the chemical composition of the electrolyte upon the nature of the deposit is well illustrated in the brass bath. From a mixture of the sulphates of zinc and of copper, one gets a deposit of copper only, not of brass, but by adding cyanide to the same bath, it yields a fine brass deposit. The explanation is found in the table of potentials; the electromotive force between zinc and copper is so great that copper sulphate is a strong corrosive agent towards zinc, and prevents any zinc from plating out along with the copper.

In cyanide solutions, however, the electromotive force between the two metals is small, and a solution of copper in potassium cyanide is not a vigorous corrosive agent towards zinc; hence the zinc and copper plate out together. Concerning the acid brass bath referred to by your national secretary, Mr. G. B. Hogaboom, in his paper before the American Electrochemical Society at the meeting of 1911 in New York City, I would say that the potentials of zinc and copper lie too far apart in any acid solution now known to permit of the deposition of both metals simultaneously, although there may be some acid, not yet studied, in which simultaneous deposition may be possible.

It has long been known that the addition of small amounts of some substance, seemingly entirely foreign to the process of electrodeposition, can produce remarkable improvements in the deposited metal. An illustration of this is the gelatine or glue used in the Betts process for refining lead, which changes a spongy, treeing deposit to one of the most satisfactory known in the art of electrodeposition. Slide 7 shows deposits of copper from the acid sulphate bath at the University of Wisconsin, before and after the addition of molasses. The study of these "addition agents," as they are called, is receiving much attention at present, and valuable results will surely be obtained.

(To be continued.)

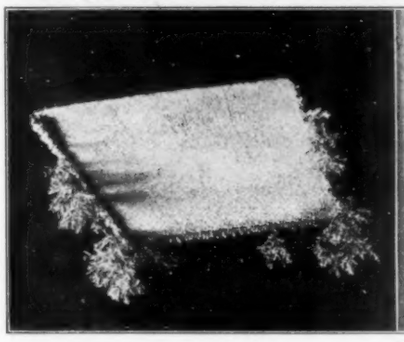


FIG. 4. ZINC DEPOSITED FROM ZINC BROMIDE.

FIG. 5. THE CURLING OF A NICKEL DEPOSIT.

FIG. 7. COPPER DEPOSITS ON A WIRE BEFORE AND AFTER THE ADDITION OF MOLASSES.

UNIFORMITY OF MONEL METAL'S COMPOSITION.

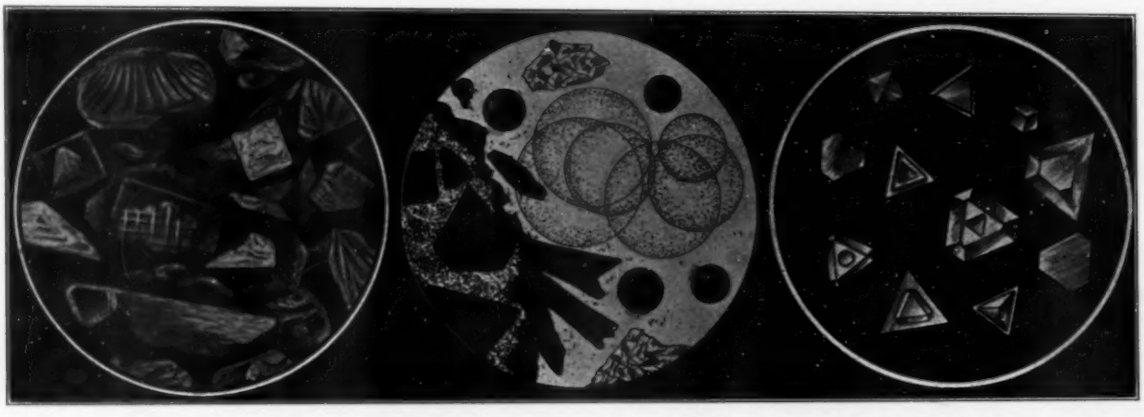
Recently analyses of cast, rolled, and forged Monel metal have been made at the laboratory of the Board of Water Supply, New York City. For such a material as Monel metal, which is not a pure alloy, the features of these analyses is the remarkable approach to uniformity in composition. If compared with the early published analyses it would appear that the manufacturers have perfected the methods of reduction from ore and matte to such a degree as nearly to control the composition.

THE ORIGIN AND PECULIARITIES OF LEAD

By James Scott.

We should seriously miss lead and its compounds if it were absent from the list of industrial metals. Its products are almost as useful as the metal itself, for red lead, white lead, lead oleate and kindred substances are very widely applied in various arts, crafts and in medical circles. We have, therefore, a good excuse for considering not only the lead itself, but some of the mixtures into which it is convertible. The chief source of lead is galena, or glance. It occurs in clusters of cubical crystals which may be split up into grayish, very brilliant, characteristic particles, an idea of which is conveyed in No. 1. It is a sulphide of lead. Less plentiful, and only little used, ores are berrusite (containing carbonate of lead), and anglesite, partly composed of a sulphate of the metal. There are three methods of extracting the metal, viz., roasting and consequent oxidation; roasting and reduction by carbon, and reduction by iron.

In the first process the metal is heated in the hollow hearth of a reverberatory furnace in a current of air. Part of the sulphide is then changed to sulphate or to oxide. Sulphurous anhydride (i. e., sulphur dioxide) escapes as a freed gas. Air is then excluded, and the heat increased, whereupon the oxide reacts with the unconverted sulphide, and metallic lead is set free. Sulphur dioxide is also again liberated. The molten metal needs refining after being tapped off.



No. 1. A magnified pin-hole view of galena —lead ore—which is a sulphide of the metal.

No. 2. A magnified pin-hole, showing how lead breaks up in heat, producing tiny spheres and speckled bubbles of gas. The colored particles are seen as crinkled, transparent flakes.

No. 3. Lead nitrate is capable of crystallizing into bold forms, as shown in this magnified pin-hole.

The second process followed is to treat the ore on an open hearth fitted with a blast pipe, the reduction being aided by coal. Inferior ores are heated in a blast furnace with a flux of limestone, or coke, to free the lead. When the ore is reduced by iron or its oxide, as in the third process, a plan generally adopted when other and valuable metals are present, it is heated, along with scraps of the metal named, in a blast furnace and produces a *matte* consisting of sulphides of copper, silver, iron, etc., as well as a silicate of iron slag. The crude lead in either case needs refining, as such factors as arsenic, antimony and iron are oxidizable, their oxides are skimmed off in the dross obtained in a shallow hearthed reverberatory furnace.

As silver is not oxidizable it is removed from the galena, which contains it in varying quantities, by the Pattison method, which depends on most of the silver settling into the still molten lead while some of the latter crystallizes out when all is allowed to cool at a slow rate. These solid portions are then removed in perforated ladles. Even when three or four ounces of silver per ton of lead exist, it can be extracted in this way. By a gradual performance of this method the remaining lead becomes very rich in silver, which is separated by being heated in a blast of air—i. e., cupelled—and the oxidized lead is removed as dross, leaving the silver behind. The fact that lead does not tarnish in dry air, and gets covered with a protective coating of oxide when in moist atmospheres, renders it extremely useful.

Among the more serviceable compounds of lead are those briefly dealt with hereafter. When lead is heated in air a rapid oxidation to litharge (otherwise called massicot) occurs. This is the monoxide condition; the substance being then yellowish or brownish-red. It is further changed to red lead, or minium, by continued heating, thereby taking up a larger quantity of oxygen. By the way, other names for this brilliant powder are saturnine, saturno, mine rouge and menige rosse. The lead can be extracted by mixing equal quantities of red lead and charcoal together and heating them in a ladle. Some idea of the curious modifications which the metal undergoes during these treatments can be gathered by laying a piece of lead foil between two glass slides, slightly separated by thin strips of glass, all being wire-bound together, and thrust into the clear air of a good fire. No. 2 illustrates this experiment. The substance needs magnifying during the manifestation of the different stages. At first the metal becomes irregularly granular, owing to the dislocation of gaseous components; and between these particles is a finer layer of *yellow* tint, which changes to brown or red later on. The more solid minute portions seem to me to have a tendency to arrange themselves into triangular shapes, a feature which is worth noticing, because the crystals of the lead salts afterwards described are similar. Round the edge of the lead nearest the heat, small perfect spheres of metal appeared, and from these arose gaseous globules which left impressions of themselves, as dotted rings inside one another. The colored portions flaked off as transparent scraps. I noticed that in burning a strip of lead foil with a match similar tiny balls of metal occurred, but they were more difficult to trace.

Peroxide, a dark brown powder, can be derived from red lead by impregnating the latter with dilute nitric acid. The nitrogen peroxide so much condemned for its use in

the bleaching of flour can be obtained as red fumes by heating dry lead nitrate, litharge subsequently remaining behind. The white salt is quickly changed to a yellow color after the dark red fumes have left its neighborhood. It is worth remarking that however shapeless this lead nitrate, lump or powder, appears to be, it is still wholly crystalline, as may be discovered by gently crushing it between two glass slides. Lead nitrate is obtainable by dissolving either the metal itself or litharge, in dilute nitric acid, thereby producing a white salt of astringent taste and properties. Its crystals are shown in No. 4. It is, of course, well known that by suspending a strip of zinc in a solution of the acetate (i. e., sugar of lead) the metal is deposited on the zinc in the form of a beautiful "tree."

White lead (lead carbonate) is found native, either as cerrusite or in the form of clear, lustrous crystals. For the manufacture of white lead one process is to attack spirals, crates or grids of the metallic lead simultaneously with acetic acid, carbonic acid, atmospheric oxygen, and water vapor; it afterwards being converted, gradually, to lead carbonate and hydrate. Another plan is to pass a current of carbonic acid through a solution of sub-acetate. A third method is to agitate a mixture of 4 parts of litharge, 1 lb. of common salt, and 16 parts of water for several hours, leading carbonic acid into it until it is neutralized.

The ancients had a very curious system of making white lead from lead suspended above vinegar, in jars, and standing the latter in manure or tan. White lead, which is sometimes called flake white, or alba, was used as a cosmetic quite 400 years B. C., being made in the way last described. It has been known also as minium album. Salts of lead are valuable for the cure or relief of ulcers, mucous discharges, internal hemorrhages, and diarrhea on account of their strong stringency. An oleate of lead forms the basis of many useful plasters for the body, and for standard solutions which are valuable for the purpose of analyzing water. It is prepared by boiling litharge, olive oil and water together.

Poisoning by lead, called plumbism and saturnism, may occur from the indiscreet use of skin cosmetics, badly managed wines and cider, and drinking water deficient in sulphate or carbonate of lime. Soft water is very objectionable in lead cisterns and pipes, especially if the metal is new. The first action is for the metal to be coated with a thin layer of lead compound, owing to the action of gases and traces of acids. If the water is not hard this compound dissolves in the water and contaminates it. On the other hand, where there is over six per cent. of chalk or other form of lime, a coating of carbonate, etc., is given to the lead, and this prevents further action in the metal, so that the water stored therein is quite safe for drinking purposes. Rain water stored in leaden vessels becomes dangerous. Workers' lungs are also capable of extracting lead from the various fumes associated with their occupation. The blue-black lines that develop in the gums and other parts of sufferers are due to the deposition in the tissues of a sulphide practically identical with galena.

TECHNICAL BOOKS.

How Not to Write Them.

By W. H. Parry.*

In poring over a technical book did you ever realize how little the writer thereof cared for the comfort of his readers? For instance, suppose that on page 4-11-44 of the book in question there is an illustration just plastered all over with all the "AAs," "BBs," "CCs" and all the way down to the "ZZs," and the written matter calls your attention to a certain part of Fig. 191 at x. The first thing you do, of course, is to find Fig. 191 and it may be that you will locate it in the fore part of the book, and then again it may be aft. However, it is, you eventually find it and possibly in doing so you have lost page 4-11-44. We will say that you find that and have held on to Fig. 191 in the meantime. Then your actual troubles have only started, as between trying to read on a page far removed from the illustration and yet keep one eye on the same, you will find that you are a very busy and a very muddled-up man, and probably after practicing this stunt for awhile, a very mad man; the more so if the volume is of very generous proportions as to thickness.

Now, any man can write a book; whether or not he is fit to do so can only be determined by the amount of trouble his readers have in attempting to extract what very meagre meat the book may contain, and as present practice is to write until one gets the "writer's cramp" and impart as little information as possible to the poor dupes who buy the books, it would seem that the successful writer of today is akin to the man who was described by his closest friend as "being able to talk all day and say nothing." Many technical books are written by men who would shine as hod carriers or coal heavers if they were given a chance, and we have always maintained and will continue to do so, unless our attention is called to the error of our ways, that an author is as good as any hod carrier or coal heaver if HE BEHAVES HIMSELF.

If we were writing a book, say on pattern making, and were determined to sprinkle illustrations pretty freely throughout, we would take care that on the opposite page to all illustrations there would be written matter bearing on THAT illustration and if one page was not big enough to describe them, then we would only describe a part of the illustration and do the same thing on the following pages, bearing in mind that this business of having a half-tone or a line drawing on one page and the descriptive matter pertaining to it five, six or sixty pages away from it, is all wrong and conducive only to some very fervent profanity.

Of course, our friends the publishers, editors and the printing ink fraternity in general will hold up their hands in holy horror at the temerity of one outside of their holy calling in holding these revolutionary views, but our idea of a real technical book is first to have something to write, then write it and shut-up. And if your book is inclined to stoutness, then make two, three, four or ten volumes of it, no more than half an inch in thickness over the covers, which ought to be of the flexible variety so that a man can lean back in a Morris chair, with his feet cocked up at a comfortable angle and not have to carry a book many pounds in weight in his almost futile effort to glean some knowledge from a book that is thick (a word that, by the way, describes many of the intelligences owned by our authors, and that is THICK). Do you know, Mr. Editor, that it is a lot better to write a book with only one page if that page will convey to the reader an idea or knowledge that is of some value as against filling up a large, fat book with a lot of "bull" that passes as "high-brow matter," when as a mater of fact it is nothing but idle vaporings.

*Superintendent, National Meter Company, Brooklyn, N. Y.

EDITORIAL

OLD SERIES. Vol. 19. No. 1 NEW YORK, JANUARY, 1913. NEW SERIES. Vol. 11. No. 1.

THE METAL INDUSTRY

With Which are Incorporated
THE ALUMINUM WORLD
THE BRASS FOUNDER AND FINISHER
THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS

Published Monthly by
THE METAL INDUSTRY PUBLISHING COMPANY (Incorporated)

PALMER H. LANGDON - - - - - - - President and Treasurer
FREDERICK F. BURGIN - - - - - - - - - Vice-President
JOHN B. WOODWARD - - - - - - - - - - Secretary

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NEW FEATURES 1913

In issuing a 152-page trade journal at this time; the opening of the eleventh year of the life of THE METAL INDUSTRY, we have again lived up to our principle of "larger, better and more interesting than ever." It will be found upon going through the pages that the quality of the matter published has been kept strictly up to the standard, while the quantity has been greatly increased. There are no fewer than twenty-two complete articles to be found in the front part of the number and the balance of the matter will be found equally interesting. One new feature that we have in store for 1913 is as follows:

PRIZES FOR PROGRESS.

In accordance with the suggestion in the letter published in the correspondence columns of this issue, THE METAL INDUSTRY has decided to offer prizes for progress in 1913. The character of these prizes will be decided upon later and will be awarded after the close of the current year to those who in the estimation of certain judges (the method of judging will be determined upon later) have made the most progress in their particular line. While the scheme has not been completely worked out, there will probably be three prizes. There will be a prize each for the one who makes the greatest advance in plating, founding and in machine shop practice as applied to the metal industry.

The manner of applying for such a prize will be extremely simple. All that is necessary will be to recount what has been done, describe a process and furnish photographs of a machine or apparatus. All matter that is considered good enough to publish will be paid for at regular rates and any one ACTIVELY connected with molding, plating or finishing and machining can compete. So moulders, platers and finishers, get busy and let the metal world hear from you!

RETROSPECTIVE REVIEW OF 1912—OUTLOOK FOR 1913

A Brief Report of Business Conditions Existing in the Metal Industry for the Past Year. Prospects for 1913, and Passing Notice of Some of the More Notable Business Events and New Labor-Saving Devices and Methods.

Business conditions existing throughout the year 1912 did not differ in many respects from those of 1911. A general feeling of uneasiness prevailed practically all the year which at this writing has not entirely disappeared. The result of the presidential election, contrary to general expectations, did not have the effect of clearing up the situation. With the return of the Democratic party to power and the birth of the Progressive party, the bugbear of tariff reform is once more brought to the notice of the people. Industrial enterprises have been held in abeyance and probably capital will be closely guarded until well into the New Year. The new legislature, soon to be convened by President-elect Wilson, will undoubtedly set to work on the tariff question and manufacturing interests of all descriptions are holding to a conservative policy until some thing definite has been decided. While it is practically certain that some tariff changes will be made, it is not believed by a great many that anything very radical will be attempted by the new administration. In any event the country is in too good a condition generally for any lasting depression in business to result from tariff tinkering. From all over the country come reports, as evidenced in the "Trade News" columns of this issue of THE METAL INDUSTRY, that business prospects are of the best and it only needs a complete return of "public confidence" to make 1913 a banner year in every way.

SOME IMPORTANT EVENTS OF 1912.

Among the rolling mills and metal shops there has been few happenings of importance to distinguish the past year from any one other. The plant of Toronto Brass Company at New Toronto, Canada, was partially destroyed by fire early in the year and has since been repaired and is again in running condition. The Standard Brass and Copper Company at Hastings-on-the-Hudson, N. Y., completed their brass mill* and it will shortly be put in operation. The little seamless brass and copper tube mill, built at South Britain, Conn., by Ferdinand Deming, as told in THE METAL INDUSTRY for September, 1909, has been dismantled and the machinery moved to Baltimore to become part of the plant being designed and constructed for the Baltimore Tube Company at Baltimore, Md., by Charles S. Morse, the well-known brass rolling mill engineer, who, by the way, also designed and built the extensive tube, rod, wire and sheet mills of The Standard Brass and Copper Company mentioned above. The Chase Rolling Mill Company of Waterbury, Conn., put their large tube mill at Waterville, Conn., in operation and have started on the installation of the private trolley line which is to connect the plants of the company in the two cities. The American Brass Company of Waterbury, Conn., moved their executive offices of the Ansonia branch to Ansonia, Conn., from New York and have broken ground in Waterbury for a large office building to be occupied by the executive forces of the Waterbury plants. The Rome Brass and Copper, Rome, N. Y., is running the recent large additions to their plants as also is the Bridgeport Brass Company at Bridgeport, Conn., who recently moved their offices from New York to Bridgeport. The Buffalo Tube Company, Buffalo, N. Y., moved their plant to Erie, N. Y., where they are now in operation. The western mills are operating at practically full capacity and improvements are under way or contemplated; at the plant of the Detroit Brass and Copper Company is this especially true with new annealing furnaces now being installed.

The Michigan Smelting and Refining Company, Detroit, Mich., has its new plant in operation and the description of this plant in this issue of THE METAL INDUSTRY makes interesting reading. The H. Mueller Manufacturing Company, Decatur, Ill., are pushing to completion the plant at Sainia, Ontario, Canada, which they hope to have in operation by March 1. The Ajax Metal Company of Philadelphia, Pa., are building on the ground recently purchased there and soon will double their present capacity. The Colonial Brass Company of New Haven, Conn., in spite of a disastrous fire have relocated their plant with larger and better facilities than before.

The United States Assay Office at 27 Pine street, New York, early in the year put into operation the fine new gold and silver electrolytic refinery. This plant was fully described in the July number of THE METAL INDUSTRY.

In view of the increasing demand for aluminum, preparations are now under way to largely increase the supply of the useful metal. The Aluminum Company of America are, as told in the article on another page of this issue, greatly enlarging their capacity for production and the Southern Aluminum Company, under the able direction of De Paul Heroult (co-inventor with C. M. Hall of the process at present in use for the reduction of aluminum from bauxite), are rapidly equipping a large plant at Whitney, N. C. As told in THE METAL INDUSTRY for November this plant will have a capacity that will enable it to turn out 25,000 tons of the metal per year. In September of 1912 Dr. Alfred H. Cowles, president of the Electric Smelting and Aluminum Company, Lockport, N. Y., read a paper before the World's Congress of Applied Chemistry held in New York City. Dr. Cowles in his paper described a process that he and Dr. Adolf Kayser had perfected to produce alumina, hydrochloric acid, caustic alkalies and a white hydraulic cement from lime, salt and clay.

This process which is now in use at a factory at Sewaren, N. J., under Dr. Cowles' personal supervision, represents the latest and most important improvement in the manufacture of aluminum that is known

*THE METAL INDUSTRY, February, 1912.

today. Dr. Cowles, who, with his brother, was the first to produce aluminum in this country, says of the discovery:

"This process opens the way to secure alumina cheaply, or as a by-product in conjunction with these other products, of great consumption in the industrial arts. By the general introduction of this process, we may hope to see the cost of production of the metal aluminum reduced four or five cents a pound."

SOCIETIES AND ASSOCIATIONS IN 1912.

There has been great activity among the many scientific societies throughout the year. Among the organizations devoted to foundry and machine shops, the important sessions culminated in a large foundrymen's convention held in Buffalo, New York, in September. This convention, which was fully described in the September and October numbers of THE METAL INDUSTRY attracted a great deal of attention from all over the country. The attendance was larger than at any previous one, in spite of the change from June to September. The knowledge gained by delegates to this gathering, whether from association papers and discussion or from the exhibition of foundry equipment, was wide and varied and its influence will always be felt. The convention and exhibition for 1913 will be held in Chicago, Illinois, in September, and is expected to far surpass anything yet attempted. The American Society for Testing Materials has during the past year formulated and adopted standard specifications for the sale and purchase of raw metal in the shape of ingot copper and spelter, and also for copper manufactured into wire and maganese bronze in ingot form.

The International Society for Testing Materials held its sixth congress in September, and the proceedings, not yet published, will make a volume of over 1500 pages, while forty of the papers contributed to the Congress were by American members. The American Electro-Chemical Society held a very important meeting during April in Boston and have issued a 588-page volume of transactions, while the National Electro-Platers' Association had a very successful exhibition and banquet of the main body in New York. The various branches of the latter association have also been very active during the year and numerous open meetings and banquets have been held in Philadelphia, Chicago and other cities. A full account of the Chicago banquet is given in this issue of THE METAL INDUSTRY.

Growing out of a symposium on wastes held by the American Chemical Society in Washington, D. C., in December, 1911, the United States Bureau of Mines has started on a campaign of investigation by which it hopes to indicate the ideal furnace for making brass. W. H. Bassett (THE METAL INDUSTRY, June, 1912) made the statement that at least 10% of all the spelter used in the making of brass was lost by oxidation.

The Bureau of Mines have secured Dr. W. H. Gillet, formerly connected with the Aluminum Castings Company of Cleveland, Buffalo and Detroit, and he has outlined a plan of investigation. The December, 1912, bulletin of The American Institute of Metals gives considerable general information regarding a form which it is desired that users of brass or other metal melting furnaces should use in submitting reports to the Bureau. Copies of this bulletin may be had by communicating with Wm. M. Corse, Secretary American Institute of Metals, Buffalo, New York.

The Institute of Metals in England had a very prosperous year and have issued a 385-page volume of proceedings descriptive of the annual meeting held in London, January, 1912. The book contains all the papers read at this meeting and makes a most valuable addition to existing literature concerning the metals. Some of these papers were published in THE METAL INDUSTRY during the year and serve as an index of the great good the Institute is doing in its chosen field.

NEW APPARATUS—METHODS AND PROCESSES.

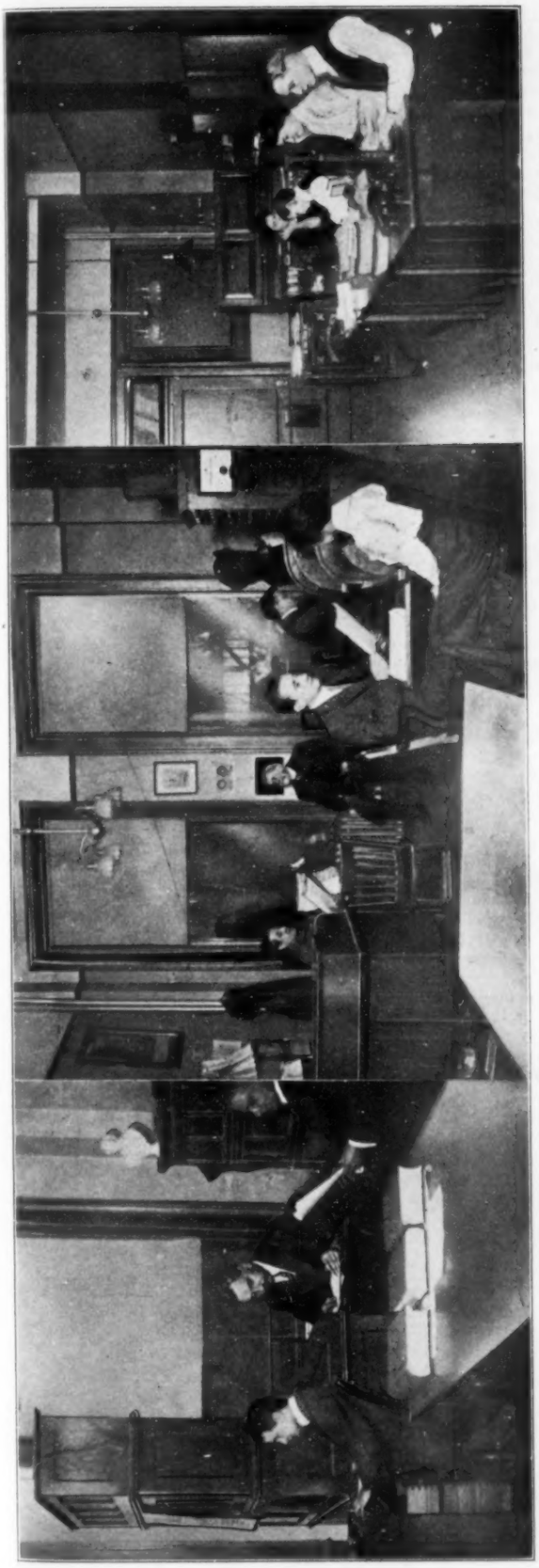
The year 1912 was not as prolific in the production of new mechanical and labor saving devices as was 1911. There were, however, a number of things that were worthy of notice and we believe that our readers were kept fairly well posted throughout the year. Among the things relating to metals may be mentioned: The extrusion of copper in special forms, such as contact rail for electric railways. The die molding of brass to make bronze babbitted bearing boxes. The electric welding of brass tubing to form a brazed tube using a low copper mixture. The production of seamless brass tubing by use of a centrifugal mold. The production of a silver aluminum alloy known as Argental. The perfection of the process of deoxidizing copper with Boron, as described in a paper by Dr. Weintraub in the November issue of THE METAL INDUSTRY.

Relating to the plating and finishing of metals we have been told of Trisalyt, a triple plating salt combining two metals and conducting salt, thereby obviating the making of a solution by the plater. Neutrol, a material used to maintain the balance of plating solutions. "Prometheus," "Konstantia" and "Vulcan" salts, which are specially prepared chemicals for use in plating and cleaning coming from Germany. "Persels," which represents a line of compounds for plating and cleaning which come to us from France. The crop of patents issued in the metal industry was fairly large and was varied enough to cover all phases of the field. THE METAL INDUSTRY published during the year notices of 135 patents, ranging from alloys to wire straighteners.

OUTLOOK FOR 1913.

The prospects for the year are brighter, business is in fine shape, though being conducted on conservative lines. Crops have been record-breaking and money is plentiful. In fact the general health of the country is so good that the mental balance of "Uncle Sam" can not be shaken and physical shocks will have to be very severe to even disturb his equilibrium—let the politicians and "tariff tinkers" hammer as they may!

TEN YEARS



CIRCULATION CORNER.

PUBLISHING CORNER.

THREE CORNERS OF THE METAL INDUSTRY OFFICES.

EDITORIAL CORNER.

In celebrating the tenth anniversary of the founding of THE METAL INDUSTRY we herewith relate a few facts of why, when and where our publication was born and what are its reasons for living in the art of trade journalism.

THE METAL INDUSTRY was established that there might be a class publication devoted to metals and alloys. There were a number of journals published in the interest of the iron industry but none that related to the entire metal industry, which includes the shops that produce goods of brass, copper, tin, lead, zinc, aluminum, nickel, silver, gold, bronze.

Our first number was issued in January, 1903, at 61 Beekman street, New York, and was a paper containing fifteen pages of text and thirteen pages of advertising, a total of twenty-eight pages. The edition was 2,000 copies. The paper took at once with metal men and by February 10, 1903, had secured enough subscribers to obtain second class entry at the Post Office.

This entry was hastened by the fact that THE METAL INDUSTRY started with the paid circulation of *The Aluminum World*, a journal established in 1894 in the interests of the aluminum industry. With the issue of THE METAL INDUSTRY *The Aluminum World* ceased publication as a separate trade journal and was incorporated with the new paper.

THE METAL INDUSTRY had been published but a few months when in May, 1903, it took over the publication issued in Philadelphia, known as *The Brass Founder and Finisher and the Electro-Platers' Review*. The incorporation of this paper with the present journal again added to the subscription list and advertising patronage of THE METAL INDUSTRY.

In September, 1907, still another trade journal was absorbed; the paper known as *Copper and Brass*, published at Detroit, Mich., which had been issued for half a year. Another gain was made in standing and prestige.

In July, 1909, by a connection with a London publishing house we were enabled to issue an English edition of THE METAL INDUSTRY, which edition is issued especially to circulate among the metal shops of the United Kingdom and the British Australian and South African colonies. The American edition circulates in North and South America and Europe. This English connection increased by several thousand copies the monthly edition.

Another valuable feature was added to the paper in February, 1911, by issuing yearly THE METAL INDUSTRY DIRECTORY, which is a guide for the buying of metals, machinery and supplies.

In 1910 THE METAL INDUSTRY outgrew its quarters at 61 Beekman street and moved to 99 John street, where it has over ten times the floor space that it had in its original office.

From the very first number of THE METAL INDUSTRY the management endeavored to issue a paper that would be useful and instructive to the industry represented, as

well as to give the latest and best shop practice and trade news. The paper was to be an authority on everything metallurgical, mechanical and chemical connected with the metal industry and to record the progress of this metallurgic art, technical, institutional and commercial.

The fabricators of metals in all forms soon found that the paper furnished the very information they desired and the manufacturers of metals, machinery and supplies early discovered that the advertising pages of THE METAL INDUSTRY were the best medium for reaching these metal fabricators. The result is that the journal has grown from a 28 page publication with an edition of 2,000 copies to a 152-page trade journal of the present number, with a total edition (American, English and Directory editions) of 20,000 copies.

The management is pleased to acknowledge the patronage of its advertisers, subscribers and authors who have been loyal to our publication for so many years and we wish to assure all that every effort will be made in the future as in the past to make THE METAL INDUSTRY larger, better, more interesting than ever.

NEW BOOK

"HYGIENE FOR THE WORKER." By William H. Tolman, Ph.D., Director of the American Museum of Safety, New York, and Adelaide W. Guthrie, Department of Research, American Museum of Safety. Edited by C. Ward Crampton, M. D., Director of Physical Training, Department of Education, New York. Size, 5⅓ by 7½ inches. 231 pages with index and numerous illustrations. Bound in cloth. Published by the American Book Company, New York. Price, 50 cents. For Sale by THE METAL INDUSTRY.

This interesting little book, which is the second in Crampton's hygienic series, while particularly designed for boys and girls between the ages of thirteen and eighteen and for vocational, industrial and manual training schools, will be found particularly useful to all workers, whether old or young. The book has been written by experts of international reputation in industrial hygiene along the plan formulated by the editors. The two main purposes of the book are to equip the workers to care for themselves under actual working conditions as they exist today and to add to their happiness and efficiency. The illustrations in the book are particularly valuable as they serve as a concise and clear aid to a more thorough understanding of the matter described in the text.

POLISHING OVER OR UNDER THE WHEEL

To the Editor of THE METAL INDUSTRY:

During my stay in this part of the country I have met a number of polishers who claim that the only proper way to do fine polishing on such work as fine hardware, sewing machine and typewriter parts, is by polishing same over the wheel. I have had about twenty-five years' experience as a polisher and buffer and can do better work and more of it by polishing under the wheel. Would you kindly open this subject for discussion in THE METAL INDUSTRY and publish letters from polishers as to the advantages and disadvantages of working over and under the wheel. I for one will be only too pleased to state in detail my reasons for advocating the "under the wheel" method.

ALEX. ROBINTON.

Herkimer, N. Y., December 31, 1912.

(The Metal Industry trusts that there are a number of polishers who will accept this challenge, and will state their views for preferring one method or the other.—Ed.)

PROGRESSIVE PLATERS

TO THE EDITOR OF THE METAL INDUSTRY:

Few electro platers, if any, are not indebted to THE METAL INDUSTRY for the information they have received through its columns; I am no exception to the rule. It has given us not only the first but the best account of the progress in the art of plating.

As one of your oldest readers I request that you consider the practicability of what I believe would be not only an interesting feature, but cause all platers to strive for better methods and solutions than are now employed.

It is as follows:

THE METAL INDUSTRY to offer a prize, either as a badge, book or bound copy of your paper for the year 1913, to the plater making the best suggestion or device for improving methods or solutions now employed in either the buffing or plating of metals, also that judges be appointed to pass on the merits of all papers submitted or that at the end of the year THE METAL INDUSTRY take a vote among its subscribers to determine who is entitled to the prize and honor.

"PROGRESS."

ROLLING AND TUBE MILL PROBLEMS

To the Editor of THE METAL INDUSTRY:

I am much obliged to "Rollinger"* for his reply to my questions. With regards to piercing tubes, suppose we take 3 billets of the following approximate composition:

		Per cent.
No. 1.	Copper	99.88
	Phosphorous	.07
	Oxygen	.02
	Impurities	.03
		100.00
No. 2.	Copper	94.4
	Arsenic	.4
	Oxygen	.15
	Impurities	.05
		100.00
No. 3.	Copper	99.7
	Oxygen	.2
	Impurities	.1
		100.0

When you try to pierce them, Nos. 1 and 2 will turn out in many cases a bad tube and No. 3 will turn out good. All three of them are excellent copper. The piercing process may eventually be made to suit all classes of copper, but some of the processes in use at the present time do not.

ERNEST A. LEWIS.

Birmingham, Eng., December 5, 1912.

*THE METAL INDUSTRY, November, 1912.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY, 99 JOHN ST., NEW YORK.

ALLOYING

Q.—Will you kindly publish a cheap mixture, yellow in color, for high pressure steam valves?

A.—We do not care to recommend any yellow brass mixture for high pressure steam valves. Copper 88, tin 10, zinc 2 is a good mixture. Monel metal retains its strength at high temperatures, but it is difficult to handle in the brass foundry. The only thing you can do is to add lead to your mixture. The Isthmian Canal Commission has recently decided to allow manufacturers of valves for the Panama Canal to add 3 per cent. of lead to 88-10-2 valves in order to machine them commercially.—J. L. J.

BABBITTING

Q.—In babbitting car brasses I have found that the babbitt is not solid in some of the boxes. We have been grinding our brasses on an emery wheel and I am wondering if this could affect them. Also kindly tell me whether they must be bored or will grinding them do, and what kind of acid should be used for tinning them?

A.—Car brasses should be machined rather than ground, for machining will give a uniform thickness of babbitt and a better job of tinning. The tinning solution is made by adding small pieces of zinc to muriatic acid until the acid is neutralized. Half and half solder may be used for tinning instead of pure tin. —J. L. J.

CASTING

Q.—Please give me a formula for casting imitation French bronze figures. I believe they are cast in bronze molds.

A.—For casting imitation French bronze figures the best metal to use is Bertha or prime New Jersey spelter. In order to make sounder castings and to avoid cracks it is advisable to add 2 per cent. of aluminum. Bronze molds are used in the casting of the figures, and these should be made of sufficient thickness, as a high temperature is required to melt zinc. For ordinary antimonial lead castings the molds may be considerably lighter in weight.—C. H. P.

CEMENTING

Q.—We are having considerable trouble with the preparation we use for cementing brass to porcelain. We are using litharge and glycerine but same does not dry fast enough as it requires from six to ten hours to dry. This is the first time that we have had any trouble with this preparation.

A.—The cause of your trouble is evidently water in the glycerine or the litharge is damp or moist. The ingredients must be free from water to ensure success. First mix up a small pellet and lay it aside to harden. If it does not harden in fifteen to twenty minutes, the probability is that either the litharge or the glycerine contains water. The litharge should be carefully dried at a low temperature and the glycerine heated over a slow flame or fire until the water is driven off. The litharge and glycerine should be thoroughly mixed, using as little glycerine as possible, in order to amalgamate them, and then add the latter until the required plasticity is attained.—P. W. B.

COLORING

Q.—Please give me a formula for making colored wax for filling engraving on ivory; also how to color mother of pearl.

A.—To produce colored waxes for your purpose use the following formula:

Paraffine Wax	¼ lb.
Beeswax	¼ lb.
Turpentine	¾ oz.
Olive Oil	¼ oz.
Dry Color (depending on the color required)	¾ oz.

Melt the waxes and oils first, then add the dry colors and mix thoroughly. Prepare small molds for running in the wax the shape required.

To dye mother of pearl use any aniline dye soluble in water and boil the pearl until sufficiently colored. Previous to immersing in the dye the articles should be boiled out in a solution of washing soda, using about one-half pound to each gallon of water.—C. H. P.

FINISHING

Q.—Would you kindly tell me how to get the Butler finish, also the French gray finish, and is this latter always the same?

A.—The Butler finish has the same appearance as the Brush brass finish, the only difference being that the surface is first silver plated. The finish is usually produced after plating by first scratch brushing, then scouring down with a soft tampico or bristle wheel, using as a scouring medium floated silex or the finest grade of pulverized pumice stone, mixed with water to which is added a very small amount of carbonate of soda. After finishing the articles are lacquered in the usual manner.

The French gray finish is practically a Butler finish, excepting where there is much detail or embossed surface. The articles are then immersed in a hot solution of liver of sulphur, 2 to 4 ounces to the gallon, until the gun metal blue is produced; then they are washed, dried and scoured as for the Butler finish. Articles, such as mesh bags, when only the frame is required to be antique, are painted with the liver of sulphur solution, using a pencil brush and then heat is applied to the articles with a Bunsen flame, producing the gun metal finish instantly. The scouring is afterwards applied as previously stated. The painting and heating of the articles naturally prevents immersing the whole article when only a part is required to be antique. The French gray finish is always the same in appearance, except that some operators use the black nickel to produce the black, others a mixture of arsenic and copper in muriatic acid. For the same purpose, on very high-grade work, chloride of platinum, dissolved in alcohol, is used. This is always applied with a brush and heat owing to the value of the platinum. The liver of sulphur as a rule is universally used for the purpose.—C. H. P.

HARDENING

Q.—We shall be glad if you will give us any information through your paper as to the best method of hardening dies for use on high speed lathes, the metal on which they are used being gun metal, admiralty mixture.

A.—There is no method of hardening high speed steel dies that is better than the one usually followed of heating to 2,300 degs. F., quenching in oil and then drawing in oil at about 550 degs. F. The results obtained from such tools are dependant more on the quality and uniformity of the grade of tool steel used than on any other single factor. The addition of a small amount of lead to these high tin mixtures is almost a necessity if they are to be machined at a high rate of speed. High speed steel tools are used for roughing rather than finishing, as a rule.—J. L. J.

MEDICAL

Q.—I would be much obliged if you would let me know if working in a zinc plant has a lasting bad effect on the health.

A.—Zinc poisoning produces cramp in the limbs, trembling, coughing, stomach trouble and blindness at night. Good ventilation and the proper precautions will prevent zinc poisoning. As

to the lasting bad effect of exposure to such conditions as prevail in many plants, where no obvious cases of zinc poisoning occur but where zinc vapors or dust are always present in small amounts, opinions differ. A large manufacturer of re-run spelter, who died at the age of sixty years, told the writer during his final illness that it was due to cumulative zinc poisoning, but his physicians assigned other causes to his illness.—J. L. J.

OXIDIZING

Q.—Kindly give us a formula for oxidizing 10% German silver

A.—German silver does not oxidize with the usual immersion dips such as liver of sulphur. It is customary to copper plate the German silver for a short time, then oxidize in a cold solution consisting of

Water	1 gal.
Liver of sulphur	½ oz.
Ammonia	1/16 oz.

This will produce a black tone. If the finish is to show more of a gun metal tone the oxidized surface should be scratch brushed, after the articles are washed and dried out. A method that you might try is to dissolve as much powdered arsenic in muriatic acid as it will absorb, using heat for the purpose; then immerse the German silver articles in this solution while hot. The fumes are not very pleasant to inhale so the operation should be done near a good draught.—C. H. P.

PACKING

Q.—Would you suggest the use of a composition of brass and zinc or would you recommend the use of Vulcabestos and similar compositions, for making a steam hose coupler gasket to stand a temperature of 302 degrees Fahr., and also to stand rough usage?

A.—The U. S. Government specifies as a sheet packing for steam or hot water, a material that shall contain a layer of gum between each two layers of insertion and so arranged that both faces of the packing shall be layers of gum. The gum must contain at least 25 per cent. of pure Para rubber and the insertion must be cotton sheeting. It must stand steam at 160 pounds pressure without injury. U. S. Metallic packing contains lead 83 1/3 per cent., tin 8 1/3 per cent., antimony 8 1/3 per cent. White brass alloys containing zinc are oxidized by high pressure steam and for this reason are not suitable for steam gaskets.—J. L. J.

PLATING

Q.—I am informed that cobalt anodes are used in America in the ordinary nickel solution, the result being a tougher and more durable deposit to the extent of about 25 per cent. Is this information correct?

A.—Your informant is in the wrong, cobalt anodes are not used in connection with the electric-plating or electro-typing industries in the United States. In electro-plating no advantage would accrue from the use of cobalt as the metal when deposited does not give a pure white color as obtained in a well regulated nickel bath, but a deposit slightly pinkish in tone by reflected light. Many of the electro-typers in the United States have discontinued the use of nickel facings and are using so called steel. The solution is made up from iron ammonium sulphate, about one pound per gallon and anodes of cold rolled steel are used.—C. H. P.

POLISHING

Q.—Is there any method by which the flaws in copper can be obliterated without copper plating? Is the streaked condition of the copper due to impurities?

A.—The streaks you refer to in sheet copper are due to an oxidization that occurs when the molten copper is run into the iron molds to produce the slabs or bars that are afterwards rolled down through various stages to produce sheet copper of the required thickness. This annoying difficulty has never been overcome by the manufacturer of sheet copper. These streaks do not occur on both sides of the sheet, so, before working the copper up into any shape, such as spinnings, it is advisable to go over the copper. If a small section of it is polished crossways and the metal is shaded with white tissue paper or placed on an angle towards the North, so that there will be no reflection, these streaks can be readily observed. The surface containing the streaks should be marked and the reverse side of the metal used in spinning shells, or where the surface is to be polished in this manner, the streaks would be overcome because they never show up on the reverse side.—C. H. P.

REDUCING

Q.—Will you kindly inform us if a reverberatory furnace would be effectual and economical in reducing shop filings, turnings and borings into ingot; also would the same furnace be the best way of recovering brass and copper from shop sweepings, casters' ashes, etc.?

A.—The reverberatory furnace is suitable for the work you mention, provided you have a considerable tonnage of the materials described, and provided also that they are not too high in zinc. The zinc is, of course, oxidized and is lost unless special means are provided for its recovery. If much zinc enters the slag it makes it very refractory. In working low grade refuse in the reverberatory furnace it is customary to charge continuously until the desired amount of metal is obtained, the slag being drawn off at intervals as it accumulates.—J. L. J.

SOLDERING

Q.—Please tell me how to make a good paste for soft solder.

A.—A good soft soldering paste can be prepared as follows: Mix finely powdered metallic tin or tin dust with vaseline so that a very thick paste is produced. The vaseline acts as a flux and the tin melting at a low temperature flows freely. A little dry powdered sal ammoniac may be added to the composition.—C. H. P.

STRIPPING

Q.—Please let me know through the Shop Problems of a good strip for copper and brass plated steel.

A.—Prepare a good strong solution of cyanide of potassium or sodium, from 21 to 16 ounces per gallon of water. Arrange the tank as a plating bath, but use a reversed current as strong as your dynamo will give. Use sheet carbon or sheet steel as cathodes. The articles are placed upon the center pole which, in this instance, is the positive instead of the negative. A few minutes immersion will remove all the metal, leaving the surface clean and bright ready for plating.—C. H. P.

TAPPING

Q.—We have a large quantity of composition rubber bushings to drill and tap; they are used for insulating purposes on electrical connecting rods. The rubber is vulcanized very hard and breaks or splits when tapped; they drill all right.

A.—Try soaking them in hot water, after they are drilled, until they become soft and you will be able to tap thread in same without any loss.—P. W. B.

TINNING

Q.—Kindly give reliable formulae for electro-tinning solution by "barrel process." We find difficulty in using the ordinary stick vat solution, which is hot.

A.—The following formula for tin plating by the barrel process should meet your requirements, if to be used upon iron or steel goods:

Water	1 gal.
Potassium Cyanide	10 oz.
Caustic Soda	4 oz.
Chloride of Tin Crystals	4 oz.

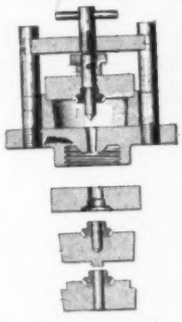
To prepare the solution, dissolve the caustic soda in part of the water, then add the tin salt. Dissolve the cyanide in the balance of the water and mix the solution together. Use plenty of anode surface and a current tension of 6 volts. For articles made from brass, copper or bronze, one-half the amount stated of caustic soda and tin salt may be used to good advantage; the other proportions should remain the same.—C. H. P.

PATENTS

REVIEW OF CURRENT AMERICAN PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

1,043,867. November 12, 1912. CASTING OF METALS. A. L. J. Queneau, Philadelphia, Pa. Assignor to Wietherill Finished Castings Company of the same place.

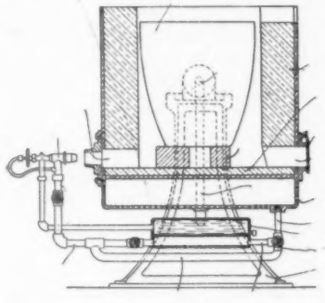
This invention relates to the reproduction in metal and by a casting operation, as shown in cut, of metal articles generally, the metal article serving as a pattern for making metal casting dies in which the casting is effected.



It is characteristic of the invention that it permits the reproduction of the metal article to be duplicated, with absolute accuracy and minuteness of detail, without requiring the services of a pattern maker, and, if desired, not only in the same metal of which the original article is made, but also in metal casting dies of the same metal, so that both in the operation of forming the metal casting dies and in the operation of casting the finished reproductions therein, the same rate of expansion and contraction will prevail throughout.

1,044,012. November 12, 1912. CRUCIBLE FURNACE. Wilhelm Buess, Hanover, Germany.

This invention relates to a crucible furnace, as shown in cut, employing liquid or gaseous fuel and comprises more particularly novel means for continuing the heating of the furnace after the latter has been tilted for emptying the crucible.



The furnace is covered by the following claim:

A crucible furnace comprising a pair of standards, a tiltable apertured casing having a pair of hollow trunnions hung in the standards, a cooling chamber at the bottom of the casing, a heating chamber tiltable with the casing, means for supplying fuel to one of the hollow trunnions, a pipe connecting the trunnion to the heating chamber, a nozzle opposite the casing-aperture, means for conveying the fuel from the heating chamber to the nozzle, means for supplying compressed air to the other trunnion, means for connecting said last named trunion to the cooling chamber to cool the base of the casing whereby the air is heated, means for conveying the heated air to the heater for heating the fuel, and means for conveying the air from the heater to the nozzle.

1,044,761. November 19, 1912. ALLOY. J. F. Duke, Manchester, England.

The alloy covered by this patent is remarkable for its cheapness, beautiful silver white color, splendid polish, softness, malleability, ductility and resistance to vegetable acids and oxidation (especially when its large iron content, over 50 per cent., is considered) is composed of the metals in the following proportions:

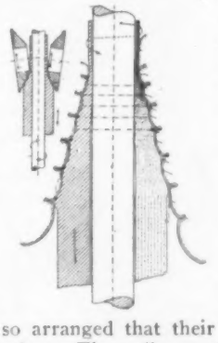
	Vols.	Or parts by weight.
Iron	12	92.40
Copper	6	53.52
Nickel	4	35.20

One vol. of aluminum or 2.56 parts by weight are added during the process of melting and a residuum of this metal varying from 1 to 2¼ parts by weight is left in the alloy, about ¼ part by weight being lost with each re-melting. Where hardness of the alloy is not objectionable, or is advantageous, 1 to 2 per cent. of tin may be added.

The inventor does not bind himself to the exact proportions here enumerated, but keeps the iron content between 40 and 52 per cent. by weight. By reducing the nickel and iron content below the content given in the example an alloy can be obtained which is harder but more liable to become tarnished and oxidized and not of the desired color. The aluminum content may also be slightly varied, an increase in aluminum producing a harder and a decrease a softer alloy. He may also substitute magnesium manganese, phosphorus, sodium, potassium, or any other suitable deoxidizing agent in place of or as an auxiliary to the aluminum.

1,044,113. November 12, 1912. APPARATUS FOR ROLLING OUT METAL TUBES. Otto Windecker, Strassburg-Ruprechtson, Germany.

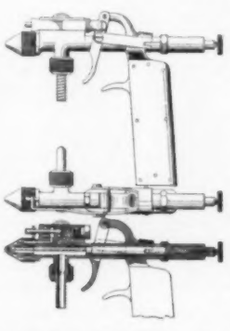
This invention relates to an apparatus for rolling out metal tubes by means of rollers, having concentric bosses thereon.



As shown in the cut, the hollow billet from which the tube is formed is placed on a mandrel and placed between conical rollers. These rollers are placed with their axles at an angle to each other and to the direction of movement of the block and the conical surface of each roller is provided with circular concentric bosses having rounded surfaces meeting each other in angles, and one roller has its last boss provided with a flat face extending beyond the last boss of the opposite roller. The rollers are so arranged that their bosses are staggered in relation to each other. The rollers rotate in opposite directions and their motion is imparted to the billet and the mandrel by contact with the former causing the two to rotate simultaneously in a clockwise direction, and at the same time feeding them forward with a gradual longitudinal displacement.

1,045,266. November 26, 1912. AIR BRUSH. Thomas A. De Vilbiss, Toledo, O.

The invention relates to air-brushes or atomizers of the type particularly adapted for the applying of lacquer, varnish, paint, bronze or other pigment of a liquid or powdery nature in spray form upon a receiving surface.



The object of the invention is the provision of an improved instrument of this character which is simple, light and durable in its construction, inexpensive of manufacture, and easy to operate, as shown in cut.

A further object is the provision of means which is easily operable to control the simultaneous opening and closing movements of the fluid pressure and pigment valves whereby the actuating fluid and the pigment are always mixed in proper proportions before being discharged from the nozzle.

1,045,718. November 26, 1912. TREATMENT OF SURFACES OF ALUMINUM OR ITS ALLOYS FOR THE DEPOSITION OF METALS THEREON. Quintin Marino, of Golders Green, London, England.

In the electro-deposition of metals upon surfaces of aluminum or its alloys, difficulty is experienced owing to the presence of a film of oxid on such surfaces. Even if the aluminum is cleaned or submitted to a pickling bath the coating will not take, or, if

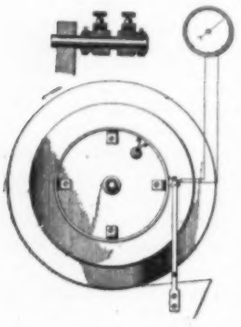
it does, it will not adhere properly and becomes detached when burnished.

The difficulty can be overcome by means of the present invention, which enables a good and adherent metallic coating to be deposited on surfaces of aluminum or its alloys.

According to the present invention the surface is subjected, after appropriate cleansing, to a solution of a suitable metallic fluorid, such for example as fluorid of tin, nickel, silver, zinc, cadmium or other metal, in conjunction with tartrate of potash or other tartrate.

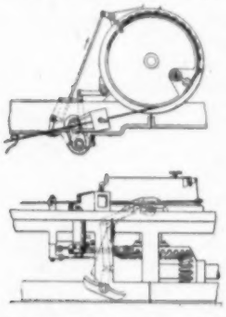
1,046,925. December 10, 1912. PYROMETER. James E. Wilson, New York, N. Y.

This invention relates to the subject of pyrometers, and it has particularly in view a novel type of thermo-electric pyrometer and associated mechanism whereby the same can be readily applied to a rotary furnace to positively and accurately indicate the internal temperature of the said furnace.

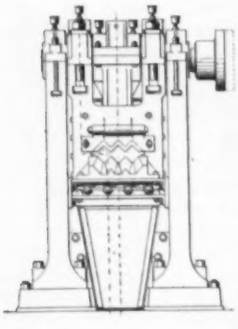


The improved pyrometer as aforesaid is of special utility in connection with the type of rotary furnaces that are used in annealing and hardening small products, and in the accompanying drawing so much of that type of furnace has been shown as is sufficient to give a thorough understanding of the operation of the invention, but, of course, it will be readily appreciated that the invention is not limited to the type of furnace shown.

1,047,168. December 17, 1912. WIRE-DRAWING MACHINE. Elbert H. Carroll, of Worcester, Mass., assignor to Morgan Construction Company, of Worcester, Mass., a corporation of Massachusetts. The present invention relates to that class of wire-drawing machines in which a rotating block is employed, whereon the wire is wound as it is drawn through a reducing die, and it has for its objects to provide an improved mechanism for connecting and disconnecting the wire-drawing block with its driving mechanism; to provide means for automatically stopping the block after the initial draft of wire through the die, and further to provide means for automatically stopping the block when the progress of the wire to the reducing block is impeded by kinks or otherwise, and these objects are accomplished by the construction and arrangement of parts as shown in cut.



1,047,185. December 17, 1912. METAL-CUTTING SHEARS. Victor E. Edwards, of Worcester, Mass., assignor to Morgan Construction Company, of Worcester, Mass., a corporation of Massachusetts. This invention relates to that class of metal cutting shears which are employed for severing metal while the same is in movement, and the metal cutting shears illustrated in the accompanying drawing is adapted for severing ingots or billets while in longitudinal movement during the process of reduction in a rolling mill.



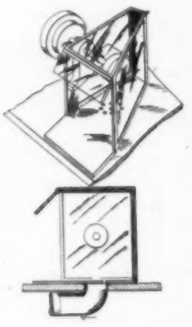
The shear is coveréd by 16 claims, of which the following are important:

In metal cutting shears, a pair of coacting shear blades, a frame supporting said blades pivoted about an axis parallel with the cutting edges of said blades, and eccentrics rotatable about the pivotal axis of said frame and operatively connected with said shear blades.

In metal cutting shears, upper and lower shear blades, stationary means for supporting the metal to be severed as it is presented to said blades, with the supporting surface of said means above the plane of the lower shear blade when the latter is in its lowest position, and means for moving the lower shear blade toward the upper blade to sever the metal.

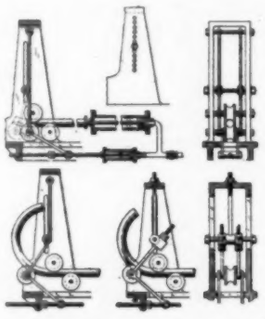
1,047,571. December 17, 1912. POLISHING HOOD. LOUIS E. Sadler, of Attleboro, Mass., assignor to the F. H. Sadler Co., of Attleboro, Mass., a corporation of Rhode Island.

This invention relates to certain new and useful improvements in polishing hoods, and the objects of the invention are to provide a hood of this character in which the same is formed of glass, as shown in cut, so as to enable the operator to perfectly see the work during the grinding or polishing operation, and further to so construct the hood that the products resulting from the grinding or polishing operation will be deflected rearwardly, in a direction away from the operator, where they may be caught at the rear or back side of the hood, by a felt, or similar member.



1,047,612. December 17, 1912. MACHINE FOR BENDING TUBES. Frederick Brantigam, Bridgeport, Conn.

This invention has for its object to provide a simple, easily operated and easily adjusted machine for bending tubes which shall be adapted for general use in large and small plants wherever the bending of tubing is required as in the manufacture of automobile and other frames.

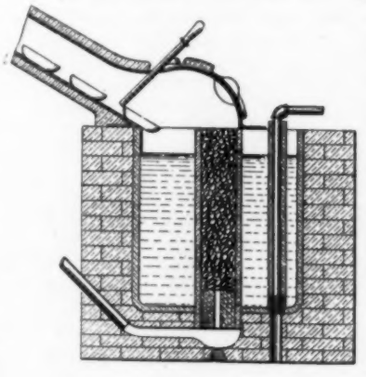


The gist of the invention lies in the use in connection with guide rolls, of a swinging bending roll and means for varying the arc of movement of the bending roll to meet the varying requirements of use.

One of the claims is as follows:

A machine of the character shown in the cut comprising guide rolls, a bending roll, cables by which the bending roll is suspended, a fulcrum engaged by said cables, a reciprocating rod, connections between said rod and the bending roll, for the purpose set forth, and a stop for limiting the forward movement of the rod.

1,046,828. December 10, 1912. METAL-MELTING FURNACE. Cyril Douglas McCourt, of Streatham Common, London, Eng., assignor to Radiant Heating Limited, of Leeds, Eng., a British corporation. This invention relates especially to furnaces for melting metals or other material and may comprise a suitable melting chamber having the desired number of heating tubes mounted therein so as to be surrounded by the charge of metal or the like and supply heat thereto, each of these tubes containing granular refractory combustion accelerating material and having an explosive gaseous mixture injected thereinto so as to cause its accelerated combustion within the granular material.



By arranging such heating tubes in substantially vertical position within the melting chamber, as shown in cut, the heat from the accelerated combustion of the gaseous mixture is transmitted outward through the tubes into the surrounding charge and the hot combustion gases passing upward through additional granular material supply further heat thereto which may be similarly transmitted outward to the charge.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

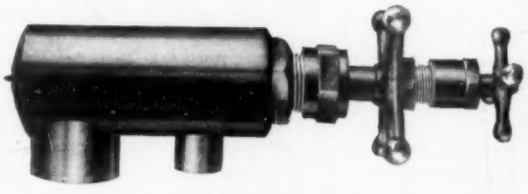
THE MARTIN MELTING FURNACE

A new furnace for melting metals which has some unusual features has been patented and put on the market by the Martin Furnace Company, 403 Keyser Building, Baltimore, Md. As shown in the illustrations, it is made with two compartments, each holding a crucible and both of which are provided with fuel oil burners. The distinctive feature of the furnace is the provision made for using the waste heat from one compartment

Patented

THE MARTIN DOUBLE CHAMBER METAL-MELTING FURNACE.

to heat the crucible in the second compartment. The furnace is designed so that the two sides are operated alternately, that is, but one burner is used at first and, while the first charge is being melted, the heat passes into the second compartment and raises the temperature there so high that it takes but a few minutes, after the second burner is put in operation to completely melt the second charge. In the event of it being desirable to melt two kinds of metal, both burners can be operated, giving two heats at once. With two metals having widely different melting points, for instance, brass and aluminum, the two charges can be melted with one burner, the waste heat from the brass being sufficient to melt the aluminum.



THE MARTIN OIL BURNER.

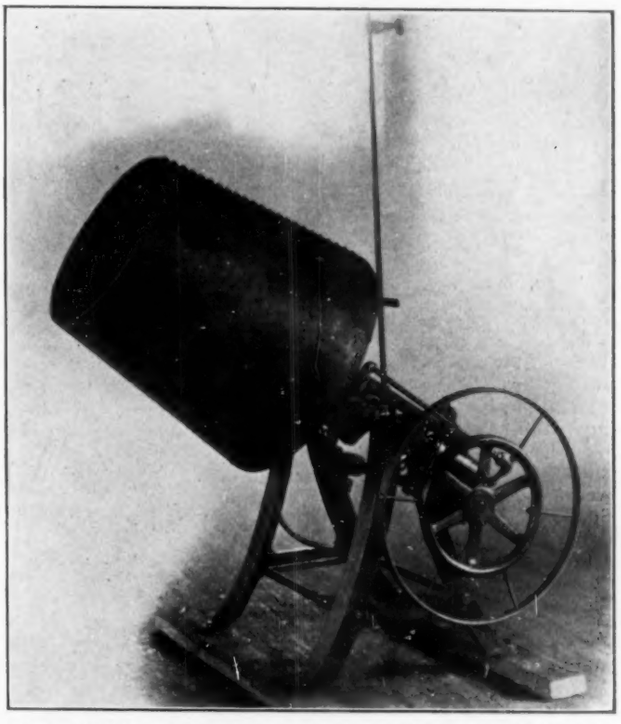
The Martin burner used on this furnace was designed so that both air and oil are controlled with valves in the burner, full pressure of air being carried to the tip of the burner regardless of how small a quantity may be required. This, it is claimed, atomizes the oil much more thoroughly than ordinary burners in which the pressure is regulated some distance back from the burner. With the Martin burner all valves on line pipes are opened full and the oil and air are regulated by the burner valves. Furthermore the air, before entering the burner, is carried in through the bottom of the furnace and superheated before reaching the burner. Air of either high or low pressure can be used. Oil can be fed by gravity or under pressure.

The furnace is very compact, taking up little or no more space than is occupied by one ordinary coke furnace. It sets low, which enables the operator to charge and stir the metal with ease. The furnace lining is composed of regular standard fire brick, and stock crucibles in sizes up to number 125 or larger may be used.

The manufacturers claim that this furnace is particularly suitable for jobbing and other foundries where it is advantageous to pour two kinds of metals simultaneously or alternately, or where it is desired to get one pot of metal ready and partially heated while the other is being melted. They also claim that the Martin burner saves fully 25 per cent. on fuel, an important consideration under the present fuel oil market conditions.

A STEAM HEATED TILTING TUMBLING BARREL

The steam-heated tumbling barrel shown in the cut is one of a very simple design but which embodies all the good qualities sought for, namely, safety, convenience, efficiency and economy in the use of steam. It is based on the idea of doing away with all back pressure. The space at the rear of an ordinary steel tumbling



STEAM HEATED TUMBLING BARREL. HENDERSON BROTHERS, WATERBURY, CONN.

barrel is enclosed to contain the steam, and in that enclosure there is a scoop that at every revolution of the barrel lifts and discharges all the water that accumulates from the condensation of the steam. The water passes out through an orifice in the neck over which a stationary collar with a cavity in it is fitted. The orifice is closed by the collar as soon as it passes the cavity. From the cavity the water descends through the curved pipe shown in the picture to the concreted floor or to any open re-

ceptacle that may be provided for it. No steam is wasted; if any is seen coming out with the water, it is time to check it where it goes in.

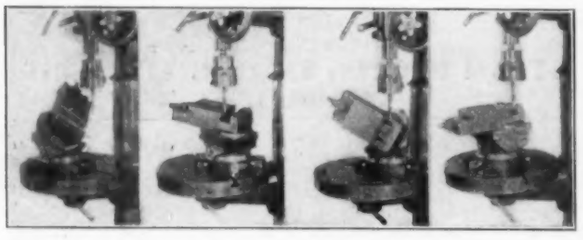
When the barrel is cold and the steam first turned on, the barrel should be left standing with the drip cock open at the lowest point till all the water is out and the steam begins to come. This barrel, for which application for patents has been made, is manufactured by Henderson Brothers, Waterbury, Conn., who have been manufacturing steam-heated tumbling barrels for the past twenty-two years.

A THREE-WAY VISE

The Aetna Three-Way Vise, shown in the illustration, is especially adapted for use with milling machines and drills. The three rotary adjustments permit placing the work in a greater variety of positions, relative to the cutter, without being loosened in the jaws, than any other vise or chuck. Each adjustment is independent of the others. The angles are read in degrees, direct from the engine divided dials.

The first adjustment is in a horizontal plane about the vertical axis. The work can be rotated through 360 degrees.

The second adjustment is at right angles to the plane of the first. It is from horizontal to vertical, or 90 degrees.



THE THREE-WAY VISE.

The third adjustment is at right angles to the plane of the second, whatever that may be. The position of the third adjustment depends upon that of the other two. The work can be rotated through 360 degrees.

The capacity of No. 1 is as follows:

Jaws will open to	4	inches
Depth	1¼	"
Width	5	"

This vise was patented August 22, 1905, and the net price complete f. o. b. is $65. It is made exclusively by the Aetna Manufacturing Company, Attleboro, Mass., who will be glad to give further particulars.

IDEAL TILTING CRUCIBLE FURNACE

The Ideal Furnace Company, at Chester, Pa., manufacturers of the "Ideal" Tilting Crucible, coal or coke fired furnace, recently installed their furnace at the U. S. Navy Yard, Washington, D. C. When the tests were made, the furnace was lighted at 7 o'clock a. m., and by 3.30 o'clock p. m. five heats of 600 pounds per heat were taken. The following is a copy of the Government's report of tests made September 19, 1912:

Started to get new "Ideal" furnace ready for first heat at 7.17 o'clock a. m., by building fire to anneal crucible and dry out furnace. Used two sieves full of shavings and two sieves full of charcoal.

Lighted off at 7.28 o'clock, charged 94 pounds of coke at 7.55, crucible red hot at 8.25, charged 540 pounds of copper at 8.35, put blast on at 8.45, charged 47 pounds of coke at 9.15. Copper all melted at 9.45, 42 pounds tin and 18 pounds zinc added at 9.55, 5.5 pounds lead added to different crucibles as it was needed.

Started to pour at 10 o'clock, finished pouring	10.5	
Furnace cleaned and ready to start second heat	10.8	
Total amount of metal melted	605.5	pounds
Amount of metal melted per pound of coke	4.3	pounds
Amount of castings and gates poured.		
Actual time of heat	1 hour 10	minutes

2ND HEAT.

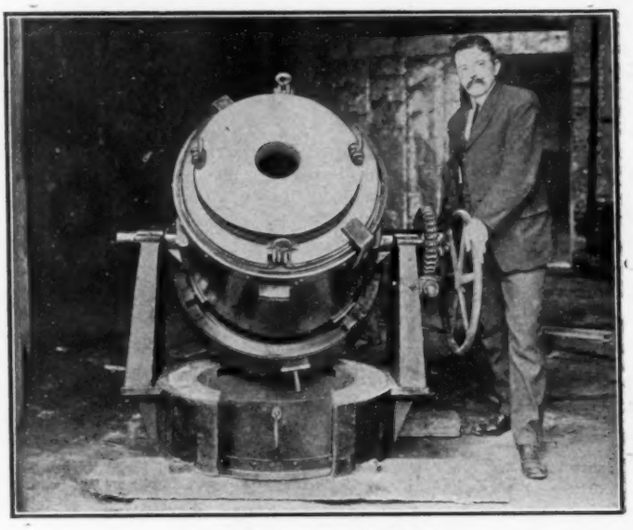
Charged 540 pounds copper at 10.10 o'clock, charged 48 pounds coke at 10.13 o'clock, blast on at 10.20 o'clock, copper melted at 11.15 o'clock, 42 pounds tin and 18 pounds zinc added 11.20; began pouring at 11.30 o'clock, finished pouring 11.37 o'clock; furnace cleaned and ready for third heat at 11.40 o'clock, 4 pounds lead added to crucible that required it.

Total amount of metal melted	604	pounds
Amount of metal melted per pound of coke	12.6	pounds
Amount of castings and gates poured.		
Actual time of heat	1	hour

3RD HEAT.

Charged 84 pounds coke at 11.45, charged 540 pounds copper at 11.46, blast on 11.48, copper melted at 12.45, 42 pounds tin and 18 pounds zinc added at 12.47; blast off at 12.55, began pouring at 1.07, finished pouring 1.11 o'clock; 40 pounds lead added to crucibles that required it.

Amount of metal melted	604	pounds
Amount of metal melted per pound of coke	7.2	pounds
Amount of castings and gates poured	601	pounds
Actual time of heat	55	minutes
Average amount metal melted to pound of coke	8	pounds



THE IDEAL FURNACE.

The "Ideal" furnace is claimed to be giving perfect satisfaction wherever installed; in most cases duplicate orders are placed for additional furnaces. The company report that they have recently made the following installations. Alberger Pump & Condenser Company, Newburgh, N. Y., six furnaces; Newark Bay Smelting & Refining Company, Newark, N. J., and Poughkeepsie Brass Foundry, Poughkeepsie, N. Y., two each; and The Troy Carriage Sunshade Company, Troy, Ohio; F. H. Lovell Company, Arlington, N. J.; Coyne & Delaney, Brooklyn, N. Y., The Canadian Bronze Company, Montreal, Can., one each.

GALVANIZERS SALVE

Many of the workmen employed in nickel plating establishments suffer from a skin disease resulting from their coming in contact with the nickel solutions. This disease is commonly known among the platers as "nickel-itch" on account of the continuous itching which it causes. It may be better termed "nickel eczema," as it appears a good deal like that disease, only that it will disappear in a comparatively short time if the workman keeps away from the plating tank. An effective remedy and preventive has now been found. This remedy is a dual one, a soap and a salve, called "Verelfa Galvanizers Soap" and "Verelfa Galvanizers Salve," which are manufactured by the United Electro-Chemical Works of Germany, and for which R. F. Lang, 33 Broadway, New York, is the sole agent.

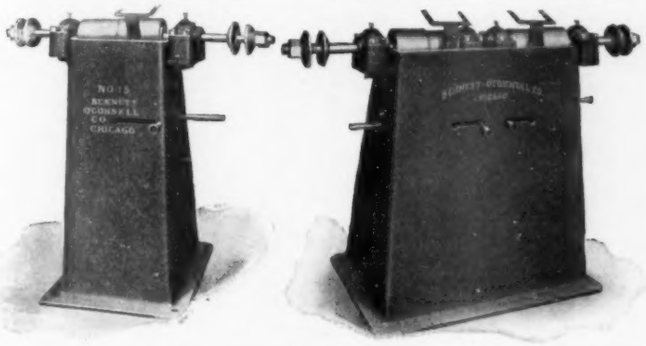
The remedy is applied by washing the hands and the infected parts thoroughly with the Galvanizers Soap after ceasing work, then applying the salve liberally.

PRICES F. O. B. NEW YORK.

1 piece Verelfa Galvanizers Soap	$.25	net
Verelfa Galvanizers Salve	.75	"
¼ kilo (a little more than ½ pound.)		
Verelfa Galvanizers Salve	1.40	"
½ kilo (a little more than 1 pound.)		

BALL BEARING POLISHING LATHES

The new ball bearing polishing lathes recently put on the market by the Bennett-O'Connell Company, of Chicago, Ill., as illustrated herewith, are meeting with favor with the users of polishing lathes where efficiency and power are the factor. The claims for these lathes are that they require much less power to operate for the fact that practically all friction has been eliminated over the old style babbitted bearings, which must be kept tight enough to prevent any vibration at high speed, but which generally increase the friction, especially where lubrication is poor and often heating in the bearings. It is also claimed that these lathes will pay for themselves in the saving of power, increase of out-put, rapid acceleration, satisfied workmen and the elimination of the delays caused by heating and trouble with the babbitted bearings



BALL BEARING POLISHING LATHES. BENNETT-O'CONNELL COMPANY, CHICAGO, ILL.

The ball bearings used in these lathes are the double bearing and are self-aligning. No matter how hard the operator may lay on his work, the bearings will align themselves and not increase the friction. The bearings are made from the highest quality of crucible alloy steel and are specially hardened. The ball races are accurately ground to a perfect radius and the bearings are so constructed that they will run in oil, insuring perfect lubrication at all times. They are made in single and double arbors, and for belting over-head or beneath the floor.

EXHIBITION OF ELECTRO-PLATED WORK

We have just received from the Techno-Chemical Laboratory, Metallurgists, Electro Chemists and Electrical Engineers of 40 Westland street, Hartford, Conn., some samples of their research work in etching, casting of white metal, novelties and also dip copper on iron and steel, which will stand plating with any color on the metal, and stay on. There are also samples of polished aluminum, brass and steel done without the use of emery cake. It is a patented process, and the public will hear more of it later on, as samples are being tried out by several manufacturers. The casting samples consist of ash trays, pin trays in colors on the metal. The etching of lamp shades, letter and sign work, tea pot stands etched on white metal, a tablet of the Lord's Prayer which is a beautiful piece of work, mounted on a mahogany base. The perforated work which is set in cement is mounted on mission bases, also other pieces etched on brass and copper which are mounted the same. They have also an insulating compound which will stand a test of 15,000 volts. It is not inflammable, and water will have no effect on it. It can be made in any color, and can be made transparent for other purposes.

They show samples of a copper deposit, which they claim they can deposit 1/16 of an inch thick in eight hours. The samples shown were plated on a soft metal, which will melt at 135 degrees F. and after the desired thickness is obtained the piece is put in hot water, and the soft metal runs out and leaves the shell. They also show a black nickel deposit which is very fine, also a new way to deposit brass, copper or silver and work the solution fast with a good color. All of the materials mentioned above are at the office of THE METAL INDUSTRY and may be seen by visitors.

The staff of the Techno Chemical Laboratory includes: Wm. H. Legate, the well known plater, electro-chemist and etcher of metals, and a researcher of note; Geo. P. Oldfield, an inventor and electrical engineer, who looks out for the construction and electrical end, Dan Monton, an expert polisher and buffer, who tests out all compositions which are made for polishing and buffing, and Francis G. Scott, the well known chemist and metallurgist. The object of this laboratory is to aid the plater in his troubles, and the inventor who has progressed as far as he can go. Also to aid the manufacturer who wants to do work faster, or to get new colors, or some new idea he may wish to carry out.

SPANISH CEDAR PATTERN LUMBER

A few years ago Lewis Thompson & Company, Inc., Philadelphia, Pa., put on the market a grade of mahogany lumber very suitable for pattern work and moderate in price. THE

SPANISH CEDAR ON THE WAY TO MARKET.

METAL INDUSTRY called the attention of the foundry trade to this pattern wood, and many valve manufacturers and other large firms are now using it, so many in fact that the available supply is nearly always oversold. To meet this condition Lewis Thompson & Company, who own large forests in Mexico, have brought out a new pattern wood, Spanish cedar, which, they state, is an even finer pattern wood than the mahogany, that it is straight grained, easily worked and will not warp or split, making an ideal lumber for pattern-shop purposes. They state that samples will be sent to responsible concerns who would like to investigate this Spanish cedar.

SELF-FLUXING ALUMINUM SOLDER

A solder, containing its own flux, which can be used in soldering aluminum to aluminum or to any other metal, is now being sold by N. D. Gleason, 26 N. Ninth street, Newark, N. J. In applying this solder the following special rules should be observed for soldering with a torch, blow pipe or blast lamp:

Scrape oxide and dirt from solder stick and from the metal to be soldered. The oxide which forms on aluminum is bluish-gray in appearance and of a consistency and character of very tenacious grease. It must be removed before the soldering can be done effectually.

Apply heat to parts to be soldered—make the heat uniform around the whole soldering area—use plenty of heat, so that the pores of the metal may be opened for the solder to enter.

The deposit of smut made on the metal by the flame used in heating must be rubbed off with a clean, dry rag. Clean quickly, so that the least possible heat may be lost in the operation.

After rubbing off the smut, tin the metal well by rubbing the solder upon it until the solder becomes fluid and then scratching the solder into the metal with a clean scratch brush, or sharp-pointed instrument.

After cooling, make the joint by heating again, rubbing the solder on the heated part until it becomes fluid and by forcing the solder to go where you want it. Aluminum solder must be forced.

Use plenty of solder; the more solder used the better the joint. The strongest joint is made by making the soldering approach as nearly as possible what in plumbing is called "wiping a joint." Of course, this applies to cases where wiping joints would apply ordinarily.

NEW FISHER FURNACE

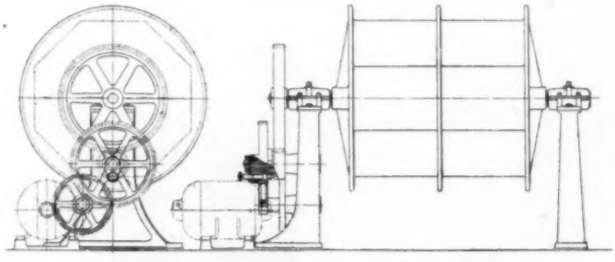
The furnace shown in the cut is the latest improved type of the well-known Fisher furnace manufactured by Alfred Fisher of Chicago, Ill. This furnace has been fitted with an attachment for using oil, so that the furnace in its present form can be used with oil, coke, coal or with a combination of oil and coke. Melters of metal, using Fisher furnaces, are thus rendered independent of the condition of the fuel market, as they can use any one of the forms of fuel that the furnace is adapted for. Recent tests of this furnace gave a heat of brass in one hour and five minutes, using coke, and fifty-five minutes using coke and oil as fuel.

THE FISHER FURNACE, ADAPTED FOR OIL, COAL OR COKE.

The taper shape of the Fisher furnace is said by Mr. Fisher to add greatly to its efficiency as the heat, especially when using oil, whirls around the bottom of the crucible and has to come up and heat the top as it passes out of the flue. The furnace, by the way, is equipped with a stack and is also claimed to be perfectly noiseless. Full particulars may be had by addressing Alfred Fisher, 1355 Austin avenue, Chicago, Illinois.

MOTOR DRIVEN BURNISHING BARREL

The Abbott Ball Company, Hartford, Conn., has developed the motor drive illustrated herewith, to meet the requirements of customers who desire to apply electric motor drive to their burnishing departments. The novel feature of this equipment lies in the clutch mechanism in one of the gears, which provides for disengaging the motor when it is necessary to turn the barrel over by hand to remove its contents. The clutch is disengaged by means of the knurled headed driving pin shown above the motor. This pin forms the connection between the gear and pinion on the second stud. The pin can be pulled out part way against the tension of a spring and then twisted so that the small cross-pin holds the end of the driving pin out of engagement with the second gear. This disconnects the drive and allows the barrel to be turned over by hand, as previously mentioned.



THE MOTOR-DRIVEN BURNISHING BARREL.

PROMETHEUS NICKEL SALTS

Nickel salts now being sold in the United States under the name of Prometheus are reported by Adolph Neubeck, who represents Dr. Friedrich Neubeck, the inventor, to be enjoying a large sale, and the best of results are being obtained by their use. Mr. Neubeck sums up the advantages of Prometheus salts over other kinds as follows:

(1) Prometheus gives the same thickness of deposit in one-third the time of the ordinary nickel salt bath. In other words, one tank will do the work of three, thereby saving not only time, but will reduce expenses for labor as well. In addition, a saving of space which might be utilized for other work.

(2) The deposit made with Prometheus is less porous, thereby preventing corroding.

(3) The deposit can be made to any desired thickness without danger of peeling. Nor will it burn, and produces a pure silver white color.

(4) It saves trouble and annoyance to the plater, as it keeps the anodes free from slime, and always retains its original high density, purity and richness.

(5) The cost of maintenance is almost nothing compared to the old solutions which require continual additions of nickel salts, and it outlives them many times. In fact, it practically lasts forever.

To test the bath, which should be done frequently, dip a strip of blue Litmus and red Congo-paper in the solution. If the bath is correct the blue Litmus paper will turn slightly purple. The red Congo paper, however, will retain its color. Should the blue Litmus paper not turn slightly purple the solution has become neutral or alkaline and the acid reaction must again be produced by adding small portion of diluted sulphuric acid of 66 Baumé, one part to ten parts of water, until blue Litmus paper again turns slightly purple. Should the red Congo paper turn blue the solution contains too much sulphuric acid, which can be remedied as follows: Mix carbonate of nickel oxide with a small quantity of the solution in a porcelain bowl to a paste, add this to the bath. After adding either of the above stir solution thoroughly with a wooden stick.

For further information prices, etc., address Adolph Neubeck, 126 Fifth avenue, New York.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE METAL INDUSTRY ORGANIZATIONS.

AMERICAN INSTITUTE OF METALS

President, L. W. Olson, Mansfield, Ohio; Secretary and Treasurer, W. M. Corse. All correspondence should be addressed to the Secretary, W. M. Corse, Lumen Bearing Company, Buffalo, N. Y. The objects of the Association are for the educational welfare of the metal industry. Annual convention with the American Foundrymen's Association in a succession of cities as invited. The next convention will be held at Chicago, Ill., September 29-October 3, 1913.

Secretary Corse says that the most important things that have transpired during the year relate to the co-operation between the Bureau of Mines and Bureau of Standards and our Institute. Prof. Chas. L. Parsons, Chief Mineral Chemist of the Bureau of Mines, attended our meeting in Buffalo and, in conjunction with Dr. H. W. Gillett, of the Bureau, materially added to the value of our meeting by entering very actively into the discussions.

The program at Buffalo was an unusually strong one, as is indicated by the fact that over three times as much discussion was reported as at any previous meeting. Dr. Gillett, as chairman of Committee on Papers, for next year already has his program under way, and there is no doubt but what next year's program will be a very good one. The scheme of having the meetings in the hotel worked very successfully, our average attendance being well above that of any previous meeting. The fact that we had our papers printed in advance was a decided help. I believe that all of our members were impressed with the increased interest taken in the sessions, which is really the test of the value of the Institute to its members.

If we can secure the co-operation during the coming year that we have had in the past and add to our membership the strength that we seem to have accumulated in the past, there is no doubt but what the American Institute of Metals has a very important work to do in the field of non-ferrous metallurgy.

AMERICAN SOCIETY FOR TESTING MATERIALS

President, Henry M. Howe, New York; Secretary-Treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa., to whom all correspondence should be addressed. The Society is affiliated with the International Association for Testing Materials and is a corporation formed for the promotion of Knowledge of the Materials of Engineering and the Standardization of Specifications and the Methods of Testing. Meets annually, the time and place being fixed by the Executive Committee.

Secretary Marburg states that the annual meeting of the Society during the past year was held in New York in March instead of as usual at Atlantic City in June. The meeting was limited to committee reports and administrative business, in order not to detract from the interest in the sixth congress of the International Association for Testing Materials, which was held in New York last September under the auspices of the American Society. The last or fifteenth annual meeting of the Society was, nevertheless, a notable one in that numerous important additions were made (confirmed by subsequent letter ballot) to the Standard Specifications and Standard Methods of Testing adopted by the Society. The Year-Book for 1912 contains 53 standard specifications for materials and methods of testing, as against 39 in the 1911 Year-Book. Another important feature of the meeting was the adoption of "Regulations Governing the Form but not the Substance of Specifications." The congress was also notable in the number of papers and committee reports, which was about twice as large as at any previous congress. Forty contributions were by American members.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS

President, Theo. Ahrens, Louisville, Ky.; Commissioner, William M. Webster. All correspondence should be addressed to the Commissioner, William M. Webster, 139 N. Clark street, Chicago, Ill. The objects of the Association are to promote in all lawful ways the interests of firms engaged in the manufacture of brass goods. Meets every three months. Each meeting fixes the place and date of the meeting to follow, consequently there is no stated place. It has been customary for the Association to hold its Annual Meeting in New York City in December.

Commissioner Webster reports that the National Association of Brass Manufacturers held one of the most successful meetings in its career at the Hotel Astor, New York, on Wednesday, December 11, 1912.

It appointed a standing list committee for the purpose of establishing proper and fair lists on new goods that may come out, consisting of Messrs. W. H. Wasweyler, Jos. H. Glauber, H. M. Hoelscher, J. W. Sharpe, Jr., A. S. Hills and E. F. Niedecken. Formally and finally adopted 13 ounces as the proper weight for a ½-inch compression iron pipe bibb and directed that notice be sent to this effect to all jobbers in the United States and Canada. Ordered a practical universal code gotten up as applying to brass goods and those shown in the official catalogue. Went on record as favoring a standard diameter for all kinds of bibb flanges. Passed a resolution in favor of one cent letter postage.

Several new members were elected; also the following officers for the ensuing year: Theo. Ahrens, president and chairman of board of trustees; trustees—Theo. Ahrens, E. F. Niedecken, C. C. Hale, H. M. Hoelscher, A. S. Hills, A. Mueller, Allen Smith, Jr.; delegates to the National Committee—J. W. Sharpe, Jr., D. H. Roberts.

As a token of appreciation of his efforts in behalf of the Association, Mr. Ahrens was presented with a beautiful diamond horse shoe pin, Commissioner Webster making the presentation address. The next meeting of the Association will be in St. Louis, Mo., March 18-19, 1913.

AMERICAN FOUNDRYMEN'S ASSOCIATION.

President, H. D. Miles, Buffalo, N. Y.; Secretary and Treasurer, Dr. Richard Moldenke, Watchung, N. J. All correspondence should be addressed to the secretary, Dr. Richard Moldenke, Watchung, N. J. The objects of the Association are for the educational welfare of the iron and metal industry. Annual convention the latter part of May or early in June each year, in a succession of cities, as invited. The Convention of 1913 will be held in Chicago, September 29-October 3.

Secretary Moldenke says that with the exception of a very elaborate series of tests on molding sands, which are still under way, the association work has been confined to the getting out of an exceptionally heavy budget of papers gathered for the recent Buffalo convention. To these were added nineteen papers presented at the recent Congress of the International Society for Testing Materials, reprinted for us in Vienna, and shipped here. The annual bound volume for this year promises to be the largest ever issued, and will be out some time in the spring.

Particular attention was given the steel casting industry, and it is hoped to wake up the malleable casting industry at the next convention similiarly. Requests for the convention papers—particularly some of the steel casting papers—came from all parts of the civilized world, which would indicate the interest taken in American foundry practice. The molding sand tests are expected to be completed shortly, the further investigations being conducted with the electric furnace.

A vigorous campaign is being carried on for new members, so that the association may gain in strength and ability to publish information for the use of its members and the industry as a whole.

Many requests are coming in from our members asking criticism of their cupola melting practice, indicating that the thorough discussion of this fundamental problem of the foundry was of a direct interest to those who attended the Buffalo convention.

NATIONAL BUREAU OF METAL AND SPRING BED MANUFACTURERS

President, H. H. Marcusson, Chicago; Commissioner M. Wulpi, Monadnock Building, Chicago. All correspondence should be addressed to the Commissioner.

The eighth mass conference of the Bureau was held in Chicago, December 5 and 6, 1912, with sixty-seven manufacturers present. A number of addresses were made on timely subjects and the conference was the most valuable and enthusiastic ever held. Five applications for membership were received, and the reports of the officers and various committees were highly satisfactory.

INSTITUTE OF METALS

President, Professor W. Gowland, F. R. S.; Treasurer, Professor Turner, M. Sc.; Secretary, G. Shaw Scott. All correspondence should be addressed to the Secretary, G. Shaw Scott, M. Sc., Institute of Metals, Caxton House, Westminster, S. W., London, England. The objects of the Institute are for the educational welfare of the metal industry.

Secretary G. Shaw Scott reports that, as was announced at the autumn meeting of the Institute, held in London in September last, the annual general meeting of the Institute, which in former years has been held in January, will this year take place in the spring, the dates selected by the Council being March 11 and 12, 1913. By the courtesy of the Institution of Mechanical Engineers the meeting will again take place at Storey's Gate, Westminster, S. W. In the evening of the first day the fourth annual dinner will take place. Among the papers that will be presented will be Dr. G. D. Bengough's Second Report to the Corrosion Committee.

As a result of a suggestion contained in a paper on "The Nomenclature of Alloys," read by Dr. W. Rosenhain, B. A., before the Institute of Metals in January last, a committee consisting of representatives of the Institute of Metals and Allied Societies has been appointed under the name of the Nomenclature Committee, and will shortly hold its first meeting. Another new committee has been appointed by the Council for the purpose of assisting the Dominions Royal Commission in their inquiry into the question of the supply of non-ferrous metals and ores in this country. Volume VIII. of the Journal of the Institute of Metals, containing a verbatim report of Sir Alfred Ewing's May lecture on "The Inner Structure of Simple Metals," as well as the usual report of the autumn meeting and abstracts, will be issued about the end of the year.

ELECTRO-PLATERS' ASSOCIATION

President, Richard H. Sliter, Jersey City, N. J.; Recording Secretary, A. J. Stremel, Brooklyn, N. Y. All correspondence should be addressed to the Secretary-Treasurer, Royal F. Clark, 246 Fulton avenue, Jersey City, N. J. This is an educational society, the objects of which are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets at Grand Opera House Building, 309 W. 23d street, New York, on the fourth Friday of each month, 8 p. m.

Secretary Clark states that the N. E. P. A. has passed through a very successful year; the New York body has 170 members; Philadelphia, 32; Indianapolis, 17; Rochester, 31; Toronto, 31; Detroit, 47, and Chicago, 87, making a total of 415 members, being a gain of 228 for the year. Edward A. Wiman, a member in Milwaukee, Wis., has succeeded in starting a branch in that city. H. H. Williams has also started a branch in St. Louis, Mo., and A. Lamoureux in Dayton, Ohio, will soon be able to announce the formation of a branch in that city.

The fourth annual banquet will be held in the Broadway Hotel, New York City, on Friday evening, February 21, 1913, and on the following day representatives of the various branches that hold charters will meet to devise ways and means of re-organizing the National Association or body.

Thirty-one members attended the December meeting of the association. E. T. W. Faint read a paper giving the results of comparative tests on the new plating salts "Persels" and "Prometheus," stating the advantages of each over the old formula for nickel plating. This led to a general discussion of the subject and T. B. Haddow exhibited an anode which has undergone a clean reduction in the Prometheus bath.

CHICAGO ELECTRO-PLATERS' BANQUET

One hundred and thirty-nine members and guests of the Chicago branch of the National Electro-Platers' Association sat down to a feast in the Mural room of the Hotel Morrison on Saturday evening, December 14, and assisted in making history in the plating industry in the "Middle West." Electro-platers from Illinois, Indiana, Wisconsin and Michigan, and the official representatives of thirty-eight manufacturers joined hands in making this a memorable event. An informal reception was held in the hotel parlors, beginning at 5 o'clock, where many old acquaintances were renewed and new ones made, and a spirit of good fellowship prevailed through the entire evening between employer and employee.

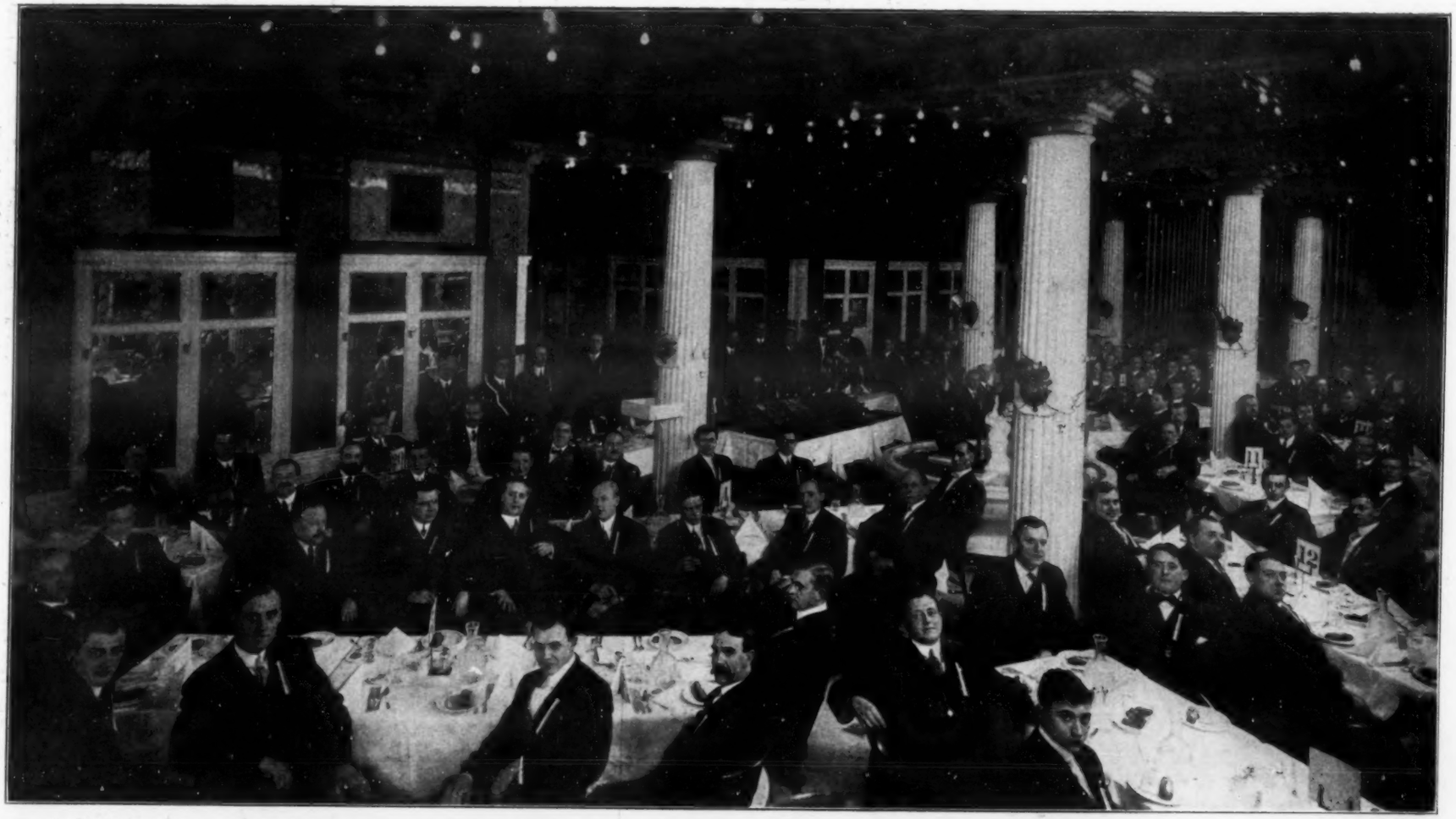
After the banquet the meeting was called to order by E Lamoureux, chairman of the banquet arrangement, with an address in which he stated the objects of the gathering as follows:

"The object of this meeting is twofold: First, it is our desire to impress the progressive plater who is not in the fold with the aims and objects of this society and solicit his membership; the second object, and the one which was the means of inviting the employers of platers, was with a view of impressing upon them the fact that we are an educational society, and thereby gain their confidence and support. The plater who is not at present a member may question the sincerity of our claims to give freely of our knowledge of the craft, and I will answer him by referring to the records for the past year only, which show approximately forty papers read at the various meetings in the different branches; covering the technical and practical phases of our craft. These papers have been given by able men for the benefit of their less able fellow craftsmen, and reach all members through the means of our quarterly. It follows that this should also convince the employer that we are an 'educational society' as claimed."

Mr. Lamoureux then introduced the president of the Chicago branch, Col. J. H. Hansjosten, as toastmaster of the evening. Mr. Hansjosten said in part:

"Let me join the previous speaker in thanking you on behalf of Chicago branch N. E. P. A. for honoring us with your presence. . . We have labored to make this occasion an event that will recur in your memory as one of pleasure and of profit, and if you, our honored guests, enjoy participating in this gathering one-half as much as we enjoyed preparing for it, we shall feel amply repaid and consider it a splendid success."

He then outlined the growth of the association since its formation nearly four years ago, and closed by remarking that "as the evening progresses and the program is gone through, both the manufacturers and the platers here present, who are not



THE BANQUET OF THE CHICAGO BRANCH OF THE NATIONAL ELECTRO-PLATERS' ASSOCIATION, HELD AT HOTEL MORRISON, CHICAGO, ILL., DECEMBER 14, 1912.

NOTES OF THE MEETING BY OUR OWN CORRESPONDENT.

The Chicago branch did themselves proud at their first annual banquet.

Much credit is due to the banquet committee, for the arrangements went off smoothly.

The members were out in force; some of them traveled two hundred miles to be there.

Col. Hansjosten, E. Lamoureux, J. H. Hall and H. E. Willmore are a hustling quartet and were right on the job during the reception.

It was a fine representation of platers from Chicago and the surrounding district.

The manufacturers and their representatives obtained a good impression of the association from the addresses delivered by the two professors from the State University of Wisconsin, and could readily see the benefit a plater derives in being a member of such an organization.

The suggestion of the chairman that the purchasing agent and the plater should get in closer touch with one another is a good idea, as the latter will thus be able to get a better grade of material to work with at all times.

The Prest-O-Lite Company, of Indianapolis, was represented by Mr. Dix, their purchasing agent; also by their foreman plater, who is president of the Indianapolis branch.

The supply houses were represented by: Mr. Lamoureux, of the Munning-Loeb Company; Mr. Liscomb, of Hanson & Van Winkle Company; Messrs. Hansjosten and O'Connell, of Bennett-O'Connell Company; Messrs. Miller and Serria, of the E. Reed Burns Company; Mr. Abbott, of the Drawn Metals Company.

Secretary Servis is a hustler, the right man in the right place. He had a smile and the glad hand for everyone.

Otto Halmbacher, the foreman plater of the H. Mueller Manufacturing Company, of Decatur, Ill., traveled all the previous night to attend the meeting, and he is "coming back' when they pull off the next one.

In fact, it was a fine mixture, the men who sell the supplies, the manufacturers or their representatives, the men who superintend and the one who does plating, all meeting together, making acquaintances and otherwise getting on a "get-together basis."

The slogan from now on is: "Chicago for the first convention of the National Electro-Platers' Association."

as yet members of the association, will see more clearly than I could explain why every foreman plater should belong to the association."

Prof. Charles F. Burgess, E. E., of the University of Wisconsin, then read a most interesting paper entitled "The Application of Chemistry to Electro-Plating," and was followed by Dr. Oliver P. Watts, Ph. D., also of the University of Wisconsin, who delivered a lecture on the "Microscopic Structure of Electro-Deposition," illustrated with stereopticon views, showing the structure of various deposits obtained in the different solutions. These papers are published in another part of this issue of THE METAL INDUSTRY.

In presenting the next speaker, H. E. Willmore, the toastmaster spoke of the high esteem in which he is held by his fellow platers and introduced him as the "Little Giant" of the Chicago branch. Mr. Willmore's paper, also published in this issue, dealt with "The Economic Management of the Plating Room."

The regular program having been concluded, the audience was invited to inspect a beautiful collection of 200 different finishes in gold, silver, nickel, brass, copper and the various bronzes, and oxidized finishes, the work of Mr. Willmore. A splendid collection of metallized objects of stones, wood, glass and earthenware, in antique shades and finishes, which were much admired by all, was exhibited by Louis Shulte.

When the "wee sma'" hours had arrived the gathering broke up, and the first annual banquet of the Chicago branch passed into history, voted by all a most profitable and happy event. Fifteen new members were secured as a result of the meeting.

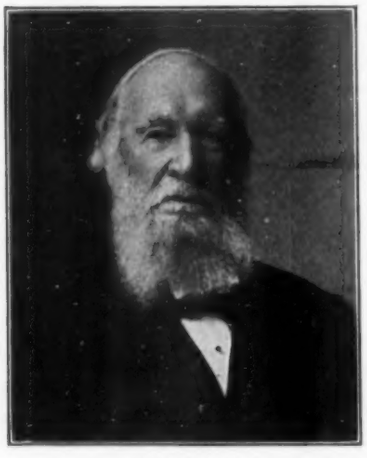
OFFICERS OF THE CHICAGO BRANCH, NATIONAL ELECTRO-PLATERS' ASSOCIATION.

COL. J. H. HANSJOSTEN, President. E. LAMOUREUX, Chairman Banquet Committee. OSCAR E. SERVIS, Secretary-Treasurer. J. H. HALL, Vice-President.

PERSONALS

ITEMS OF INTEREST TO THE INDIVIDUAL.

DAVID N. CAMP



DAVID CAMP.

New Britain, Conn., claims the distinction of having, as the president of one of its industrial concerns, the oldest man in New England who is actively engaged in an official position in the management of a great concern. The New Britain man is David N. Camp, head of the Skinner Chuck Company, and he was ninety-two years of age a couple of months ago.

Mr. Camp is at the factory office nearly every day in the year, looking after the business and directing the activities of the concern. He is a pleasant gentleman of old Yankee stock, formerly the head of the Connecticut State Normal School, a wonderful student of business conditions. Before he entered the metal manufacturing field he was identified with the New Britain Normal School, a state institution, for a number of years. He has also held the position as state superintendent of schools for Connecticut. His work as an educator extends over a period of about forty years, interrupted twice by ill health.

Born in Durham, Conn., Mr. Camp moved when a young man to New Britain, where he has made his home ever since. Besides his interest in the Skinner Chuck Company, of which he is president, he is a stockholder in many of the city's industrial concerns. He is the author of a history of his home city and a number of school text books. He has served New Britain as its mayor and represented the city in the Connecticut legislature.

To a representative of THE METAL INDUSTRY, this well-preserved old gentleman, in his office at the factory, made a statement regarding the 1913 business outlook.

"The business outlook for the year may be considered favorable," said he, "for the reason that the large crops will not only provide abundant supply for the rapidly increasing population of this country, but will allow exports to the amount of millions of dollars to other lands. The returns will enable the producers to purchase more freely not only articles of necessity, but of luxury.

"The rapid extension of railway lines," he went on, "and the increased equipment required, both the demands in the building trades for public and private buildings and their furnishings, with the multiplied requirements of the higher scale of living adopted by all classes, must necessarily demand increased production of manufactured articles."

A. L. Burrows, formerly foreman of the polishing and buffing departments of Landers, Frary & Clark of New Britain, Conn., has taken a similar position with the J. L. Mott Company of Trenton, N. J.

George V. Barker has taken charge of the plating department of the Rushmore Dynamo Works of Plainfield, N. J. Mr. Barker does plating in silver, nickel, copper and brass.

William Mintie, formerly with the Waterbury Buckle Company, Waterbury, Conn., has become associated with the F. L. & J. C. Codman Company, South Boston, Mass. Mr. Mintie will have charge of sales in the territory of New York City.

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS AND TRADE ITEMS OF INTEREST FROM THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

WATERBURY, CONN.

JANUARY 6, 1913.

Only the most satisfactory reports are heard all through the Naugatuck Valley as to the results of the past year in metal industries, and 1913 has started under most favorable circumstances, even the customary lull that is looked for at inventory time being absent. Some of the companies in Waterbury and other Naugatuck Valley towns have done their best year's business in the year just closed, although its first half was one of uncertainty. Thus is it shown that the latter part of the year, although marked by the presidential campaign, was one of more than normal activity. With the exception of very slight symptoms in one or two smaller industries, everything that can be taken as an indication of future conditions points to steady going for some time to come. Few of the shops in Waterbury closed down for more than one or two days at Christmas. Whatever shutdowns there were, were chiefly to allow time for repairs to machinery, and in many instances work of this kind has been attended to without stopping the general activity of the plant. It has been sufficiently urgent to keep the Waterbury Farrel Foundry and Machine Company unusually busy, and the smaller machine shops and expert machinists have been kept on the jump to meet the demands of the period. These circumstances alone are eloquent of the prosperity of local concerns.

In towns outside the city conditions are almost similar. Winsted's plants are busy, particularly the Gilbert Clock Company, where all departments are running full time. Some of them have been operating half an hour overtime six days a week. Torrington also reports enough business to keep them all hustling. The Coe Brass branch of the American Brass Company there has been rushed with orders for some time and has filled orders for large quantities of goods for use in the manufacture of firearms and military equipment, due to the hostilities in eastern Europe, with dispatch. The new plant of the National Carpet Sweeper Company, which has been moving its hardware manufacturing branch from Newark, N. J., to Torrington, is getting settled and in a few months will be well acclimated. There has been much activity in the Union Hardware Company's plant, although the skating season hereabouts has not as yet helped its skate-making branch. The Torrington Company has had a successful year.

In Thomaston the Seth Thomas Clock Company has not been as busy of late as it was earlier in the year, and took advantage of the holiday season to shut down for a longer period than some of the other plants of the valley. The Plume & Atwood Company's Thomaston plant is fairly busy.

Below the city there has been much evidence of prosperous times in the activity of the Ansonia, Derby and Shelton industries. The Ansonia plant of the American Brass Company has been very busy for many months and continues so. The scores of smaller companies, the Farrel Foundry Company and the Derby Silver Company (branch of the International Silver Company), experienced a generous year's business, everything considered, and have started on the road for a better result, if conditions continue as at present.

There has been much small building during the past year, and the completion of some extensive additions to large and small plants, begun over a year ago, was accomplished, with the result of better arrangement of departments and the installation of much improved machinery, all of which represents a considerable outlay for improvements. The Waterbury Farrel Foundry and Machine Company has just completed a large addition to its plant, covering the site of the old railroad station on the Naugatuck Railroad line which was abandoned on the completion of the Union Station. The Scovill Manufacturing Company has put some of its new floor space in the additions recently completed into use during the past year, and its plant now is one of the finest in the world in this class of industries. Much of the land to the east of its property which has been unsightly for years has been brought into the area regularly used, and what of it has not been covered with additions to the plant bespeaks prosperity.

Near the Scovill plant the E. J. Manville Machine Company has begun to expand and will soon have a fine addition on the land adjacent to its original plant on East Main street. The big building job of the year has been that in Waterville undertaken by the Chase Rolling Mills Company, on the new tube mill, and its progress has been rapid. The trolley line, for freight and passenger service, connecting the Chase plants in the north end of the city with the Waterville plant and the main tracks of the Naugatuck Railroad line, is practically completed, although the work was considerably delayed by the scarcity of labor during the last four or five months.

As an illustration of the conditions regarding labor, and brought about wholly by the rush of business in the factories, the contractors on this piece of work found it necessary to advance the prices they offered from $1.65 a day to over $2 a day in order to keep enough men on hand to make only ordinary headway. Labor prices also advanced in many of the shops for extra hands. The year just begun will probably see the completion of the new office building of the American Brass Company, for which the foundations are now being laid.

There were few changes of great import during the year. One of the most recent—the resignation of General Manager A. P. Hines, of the American Brass Company—has not been followed by any appointment to his former place, and it is likely that he will be active among the advisory officers of the company for some time, but he has been relieved of most of the detail and responsibility of his previous position. Franklin A. Taylor resigned as vice-president and general manager of the Randolph-Clowes Company, and his place has not yet been filled. Mr. Taylor has since taken charge of the affairs of the New England Watch Company, whose stockholders asked for a receiver several months ago, and he has "made good" to the great benefit of the company. Prosperous times undoubtedly helped it much, but Mr. Taylor's ability in disposing of thousands of time-pieces which it had put up as security for loans, helped fully as much, and its prospects for continued success and an early departure from whatever ruts it has been in are bright. Charles E. Miller, president of the Randolph-Clowes Company, is filling Mr. Taylor's place himself.

There were two deaths during the year which created wide gaps in the circle of the older manufacturers of this section—that of George H. Clowes and of Henry L. Wade—both well known throughout the metal industries. January has opened with firm and steady demand and certain pluse, and there is no prospect now of any serious slackening of speed in the local industries until spring, if then. Whether a continued advance in copper prices will have a tendency to offset these conditions is a question few are bothering about now.

The two-story brick factory building, 60 by 160 feet, being constructed by the Waterville Corporation, is one of the buildings of the new brass mill plant being built by the Chase interests at Waterville.

The Waterbury Buckle Company has started the erection of its new four-story and basement factory, which will be 123 by 58 feet. This concern has a large plating department.

The engineering business of A. C. Campbell has been incorporated under the title of Andrew C. Campbell, Inc., and will manufacture metal specialties, particularly the Campbell self-spreading cotter pins, on which the company hold patents. They are just completing a new factory building having 16,000 square feet of floor space part of which will be rented out.—F. B. F.

PROVIDENCE, R. I.

JANUARY 6, 1913.

The year 1912 closed as one of more than average prosperity throughout the State of Rhode Island, in all lines of industry, but particularly in those which include the metal trades. While Providence is one of the recognized largest centers of jewelry manufacturing in the world, the year just closing shows that the concerns and establishments representing the output of various kinds in baser metals have also enjoyed satisfactory prosperity. The increasing use of the automobiles and motor vehicles of every character has greatly accelerated business in the requisitions for brass work, especially tubings and nickel work. Foundry work has also been unusually brisk. A very self-satisfied and optimistic feeling prevails among the manufacturing jewelers, as well as those engaged in allied and kindred trades, as to the outlook, and all indications seem to point favorably to a prosperous condition of business during the current year. In his annual review of the local industrial conditions, G. G. Cameron, manager of the Providence office of R. G. Dunn & Company, says concerning the jewelry industry:

"Thirteen failures occurred during the past year among the jewelers of this city and the Attleboros. These had liabilities aggregating upwards of $125,575, as against assets of $33,456. Jewelry manufacturers as a whole have done an increased business over 1911, especially those concerns that are engaged in the manufacture of bracelets, lockets and chains. Makers of silverware, and also of sterling silver novelties, have done an increased volume of business and made money. Manufacturers of machine tools have increased their business approximately twenty per cent. and are well satisfied with the profits of the year. Manufacturers of files have also increased their output and show a healthy gain over the previous year."

With business brisk among the silverware manufacturers throughout the country, the past year was one of the best in the history of the industry. With the other concerns of the country the Gorham Manufacturing Company enjoyed a very satisfactory year, although not quite up to that of its banner year, 1910. The early months of 1912 showed a decided increase in the total volume of business done, but the later months showed a lagging tendency in trade, which to a considerable extent offset the possibility of a record-breaking year. In speaking of the outlook for the year 1913, Vice-President John S. Holbrook said recently that he considered the indications as fair. In the bronze department of the Gorham Manufacturing Company the volume of business has exceeded all previous years, and there are orders on the books sufficient to keep the foundry going to its full capacity for more than a year. During 1912 the facilities of this department were more than doubled, yet this large increase has not been sufficient to keep pace with the influx of orders.

There is much interest being manifested by the manufacturing jewelers here as to what the incoming Congress intends to do regarding the tariff. The welfare committee of the New England Manufacturing Jewelers and Silversmiths' Association plans holding a series of smokers, at which speakers will be present to talk upon subjects pertaining to the industry and to the conditions that surround it. A special committee has been appointed by President Harry Mays to watch matters pertaining to the tariff controversy, and already a number of conferences have been held by the members of this committee and the members of Congress from Massachusetts and Rhode Island and arrangements made, whereby the association will be suitably represented at all hearings of the ways and means committee of House during the consideration of the various schedules in which the jewelry industry is interested.

The Standard Machinery Company, of this city, has broken ground for its new plant on Elmwood avenue, Auburn, and the actual construction is already under way. The concern has six acres of land lying between Elmwood avenue and the main line tracks of the New York, New Haven & Hartford Railroad, and will erect three buildings which will more than triple the capacity of the company's present quarters in this city. The new plant will include a main building, 725 by 125 feet; a forge shop, 100 feet square, and a power plant, 70 feet square. The company will also install a large engine and generator of the latest type. It is expected that the plant will be ready for occupancy by May or June.

Charles F. Charnley and Joseph A. Charnley, of Cranston, R. I., and F. Webster Cook, of this city, are incorporators of the A. J. Charnley Company, which, with a capital stock of $40,000, has been incorporated under the laws of Rhode Island to manufacture jewelers' findings and other metals.

The Slade Manufacturing Company, formerly located at 72 Bates street, have gone out of business.

Plans are under way for the construction of a new building to take the place of the one now in use by the Newell Brass Foundry on High street, Central Falls. This change is made necessary by the layout which has been made in connection with the proposed abolition of the grade crossings, the new lines as drawn to run through the present site of the foundry. At present there are three buildings in use at the foundry, but it is the intention of the owner, Fred E. Newell to make the dimensions of the new building large enough to carry on the entire business under one roof. The site of the new building will be a short distance to the east of the present structure, on land owned by Mr. Newell.—W. H. M.

ATTLEBORO, MASS.

JANUARY 6, 1913.

Looking back on the year, the jewelry trade finds it to have been far more prosperous than at the outset seemed possible. Its advent was accompanied by sinister warnings that it was presidential year and, according to old-fashioned ideas, the American business man should consent to be a victim of industrial paralysis when this came around. But the influence of bumper crops and the outgrowing of the old traditions changed this. It was a busy year, at times extra busy, and only a man with a perpetual grouch had any license to be a pessimist. The spring trade was fair and the fall was as usual booming; better than that, the total orders from the jobbers who came east just before the holidays promise a busy spring and give a fine flavor to New Year's rejoicings. The only fly in the ointment is the tariff. A Democratic Congress, with fine discrimination, have allotted three whole days in January to hearings on the metal schedule which involves some sixty industries of which jewelry is one. If the duties are as ruinously cut as in the metal bill which President Taft vetoed, the jewelry trade will be apprehensive for, it will be remembered three innocent lines in that bill halved the jewelry duties without giving a hint of their intention or effect.

The year has seen many changes in the local industries, chief of which probably was the retirement of James E. Blake from the firm of J. E. Blake & Company and the reorganization of that company. The town of Plainville and the village of Chartley this year saw rebuilt the factories of which fire had robbed them. A move was made in the legislature toward a jewelry school for this district, one-half of the expense to be borne by the State. In April the Pollock Safety Clasp Company located here. Freeman & Daughaday, of Norton, was capitalized at $400,000 and incorporated. Horton & Angell, R. F. Simmons, W. E. Hayward Company all built and occupied extensive additions. The commercial rate on electricity was cut to 12 per kilowatt hour July 1, but fifteen months' endeavor has not produced a decision from the State Board on the price of gas which so directly affects the jewelry trade. The Oscar H. Horning Company is the name of a new concern which has been formed at North Attleboro, Mass., to manufacture silver and German silver novelties. J. L. Wiggmore entered the firm of Moore & Lonergan. C. K. Grouce, a new emblem concern, started in North Attleboro. The F. S. Gilbert Company was sold to M. J. Baer, E. F. Wilde and M. Harzberg. Plans were made to entertain the National Jobbers here in 1913. The Y. M. C. A. again conducted with great success its evening classes of jewelry.

The Allison Manufacturing company is to move into new and larger quarters by removing from the basement to the first floor of the Bigney building. Straker & Freeman, of North Attleboro, are building a big addition to their plant. The new factory of Whiting & Davis of Plainville is nearing completion. The Na-

tional Wholesale Jewelers' Association, which is to meet in Providence in April, is to be entertained by both Attleboro and North Attleboro. The W. E. Richards company has moved into larger quarters in the Ingraham block. The White Manufacturing Jewelry Company is a new concern in the Makepeace building. F. D. White is president. The Standard Novelty Company and the American Chain Company has started business in the basement of the Robinson building, on Railroad street. Spring business is now in the air. The holiday season has been fully up to expectations, and the next step is the preparation for the spring showing.

The Massachusetts Bureau of Statistics reports the following jewelry statistics for Attleboro: Number of establishments, 68; capital, $7,273,574; value of stock and materials used, $3,155,185; average yearly earnings of employes, $616; average number of male employes, 2,234; average number of female employes, 1,329; value of products, $7,064,000. In North Attleboro: Number of establishments, 40; capital,, $4,816,000; value of stock and materials used, $1,626,000; amount of wages, $1,486,000; average yearly earning, $653; average number of male workers, 1,605; average number of female workers, $670; value of products, $4,583,000. The National Wholesale Jewelers' Association, which is to hold its annual meeting in Providence in April, is to be entertained in Attleboro by the Board of Trade.

Last, but not least, the town officially adopted a new slogan: "Attleboro, the Hub of the Jewelry World," and did its best in 1912 and will do more in 1913 to live up to the title.—C. W. D.

NEW BRITAIN, CONN.

JANUARY 6. 1913.

New Britain manufacturers engaged in the metal working trades are all more or less pessimistic regarding the business outlook for the coming year, and the reason for their lack of optimism seems in each case to be the fear that the incoming Democratic Congress will do some tariff tinkering that will injure American industries. All of the manufacturers would not give out statements concerning their view of the business outlook when asked for them, but a few consented.

Charles M. Jarvis, president of the American Hardware Corporation, which is made up of the Corbin industries, and is the biggest concern in the city, said, "If that portion of the Congress which threatens to make an aggressive assault upon our protective tariff prevails, and a material reduction of that tariff is made, I believe that it will mean industrial depression extending over months and perhaps years. I wish I could be more optimistic, but it would be foolhardy for any manufacturer to be optimistic in the face of danger of this kind." George W. Traut, president of Traut & Hine, said, "I believe that, if it were not for the change of administration, business for the next year would continue fully as prosperous as it was this year, but I now feel and already notice some indications that there will be more or less a slowing down in business. Business men will go along slowly and carefully until the uncertainties of the tariff are settled."

President Alex W. Stanley, of the Stanley Rule & Level Company, manufacturing "Stanley Tools," took a more cheerful view of the prospects. He spoke first of the splendid business of presidential year, and said "With the present crop condition there is no reason why the entire year 1913 should not prove satisfactory unless the new national legislation proves more harmful by long drawn out uncertainty or by drastic changes in the tariff than it is at the present time expected to."

H. C. Noble, secretary and treasurer of North & Judd, said, "During the early part of the year 1913 we look for a continuation of the remarkable prosperity which the business world is now enjoying. Unless all precedents are broken, however, the changing of the tariff along lines which, we take it, have already been mapped out, will have a tendency to create much uncertainty and hesitation in business circles and lead to exercise of caution and slowing down of the wheels of progress."

Robert H. Pease, treasurer of the New Britain Machine Company, and the youngest of the factory officials interviewed, showed optimism to be predominant in youth, by saying, "Manufacturing of all kinds has such an impetus behind it of unfilled orders that it will be many months before any decline in the demand for products will be appreciable."

There is no question but that the year 1912 was the biggest business year in the history of New Britain. Until the Democratic Congress meets and indicates, by legislation, just what is to happen to the protective tariff, it is generally believed here that manufacturing concerns will go slowly.—A. L. M.

MERIDEN, CONN.

JANUARY 6, 1913.

Upon reviewing the business of the past year, one discovers at least two factors which have influenced conditions greatly. The one of greatest importance, because its effect cannot be disputed, is the marked advance in the selling price of metals. Silver, which was selling for .57⅞ per ounce in January was quoted at 66¼ in December. This has made necessary an advance in the selling price of the products of the silverware factories. Tin, which is the principal constituent of the base alloy which enters into the manufacture of silver-plated hollow ware, which was quoted at .42½ per pound in January is now quoted at .49¼. Copper has advanced three cents per pound, from .14¼ to .17⅝. This increase in the cost of these three metals which are used so extensively in our local factories has without a doubt decreased the profits for the year and probably has tended to diminish the volume of business. As one manufacturer stated the case, it has increased the cost of our raw material 25 per cent. and we have not been able to increase the selling price of our goods.

Whether the uncertainty as to the outcome of our Presidential election has a depressing effect upon business is a much discussed and probably as yet an unsettled question. Yet whatever we may believe in regard to this matter, the fact remains that for the first nine months of the year business in many of the factories was below par. After the first of October business received a tremendous impetus, and from that time on the reports were most encouraging. The sales manager of one of the large plants manufacturing a line of brass goods stated that his company did 20 per cent. more business in November than they did the same month a year ago. The short time which the most of our factories closed for their annual inventory would seem to show that they have plenty of orders with which to start the New Year.

The majority of the concerns closed on December 24, the time varying from one day to two weeks. Factory E, International Silver Company, closed December 24 and resumed work January 6. Factory H, of the same company, closed on December 31 for one week. The Meriden Fire Arms Company closed December 24 and started up again December 30. The Wilcox & White Company shut down for one week. The Charles Parker Company factories closed December 24 for one week. The Wilcox Silver Plate Company shut down December 24 for two weeks. The Bradley & Hubbard Company closed December 24 and resumed work after New Year's day. The Manning & Bowman Company shut down for two weeks beginning December 24. The J. D. Bergen Company closed for one week. The Meriden Cutlery Company closed for ten days. P. J. Handel & Company closed Christmas eve for ten days. The E. Miller Company closed on December 28 for one week. The Foster & Merriam Company closed for one day only. These inventory periods, no factory closing more than two weeks, are usual under normal conditions and would seem to indicate that the local manufacturers were optimistic in their view of business for the present year.—F. O. V.

BRIDGEPORT, CONN.

JANUARY 6, 1913.

The past year has been one of continued prosperity to the manufacturers of this city, and general satisfaction is expressed by all at the amount of business done. Many firms found it necessary to build additions to their plants in order to take proper care of their increasing business, and the city has been particularly fortunate in securing a number of new industries that have either already established their plants here, or have started work on new factory buildings. Among the new industries located here during the year might be mentioned the Bridgeport Screw Company, the United Foundry & Machine Company, the Polack Tyre & Rubber Company, and the Connecticut Electrical Manufacturing Company.

The report of the State Factory Inspector for the two years

ending September 30, 1912, shows that the total number of wage earners in factories in this State in 1911 was 194,116, and in 1912, 209,797. The report further states that the number of manufacturing establishments now located in the city of Bridgeport totals 479. The Board of Assessors of this city have just completed the taxable grand list for 1912, and it is reported that the increase on manufacturing properties will be approximately $3,000,000.

Labor conditions in this city have been very good during the past year, although at one period considerable difficulty was encountered in securing enough laborers to meet the demands of the factories. At the present time, however, this situation appears to be very much relieved. No strikes of any serious proportion have occurred and with the employees satisfied with their conditions and plenty of work for all assured, the outlook for the future is decidedly encouraging.

The tariff question has received considerable attention and thought from the local manufacturers, many of whom are preparing to appear before the tariff hearings in Washington, to oppose any radical reductions on the products in which they are interested. It is apparent, however, that most of the manufacturers have considerable confidence in President-Elect Woodrow Wilson, and believe that he will not countenance any changes in the tariff which might seriously endanger the business interests of the country.

The new factory of the Bridgeport Deoxidized Bronze & Metal Company, which is under construction, suffered during a recent wind storm, the wind lifting a portion of the structure practically clear of its foundations, and as it collapsed between the brick walls the crash forced over the front gable wall 30 feet high and it toppled into the street. The damage is estimated at $6,500. The Bridgeport Hardware Manufacturing Corporation is erecting a new building on land adjacent to its plant, which when completed will be used for the general offices of the company, as it was found necessary on account of their increasing business to utilize the space occupied by their present offices for additional manufacturing room.—F. A. B.

NEW YORK CITY

The outlook in all branches of the metal industry is much brighter than was the case a year ago. The foundries in and around the city report more orders than they have had for some time, while the machinery trade participated to a very satisfying degree in the general business prosperity. In the plating and finishing line, including the manufacturing jewelers, many firms have been working overtime for quite a while, to supply goods for the holiday trade, which, the retail jewelers of New York say, was a record breaker. As was stated above, the prospects for 1913 are very encouraging, but until the tariff question has been settled the status of the metal trades will not be known definitely.

Kann & Wysor, specialists in analyzing metals and scrap materials, 62 Gold street, announce that they have greatly increased their analytical laboratory, to take care of the growth of their clientele, and are in a position to give accurate and prompt analyses at reasonable rates. The firm also represents shippers of copper and zinc bearing material in sampling and weighing.

Goldsmith, Stern & Company is a new firm who has succeeded to the jewelry manufacturing department of Stern Bros. & Company at 33-43 Gold street. This company was formed by August Goldsmith and Nathan B. Stern, formerly of Stern Bros. & Company, and Arthur Simons and Mortimer C. Foster. As the management of the business will remain in the same hands as heretofore, the policy of the new firm will remain unchanged.

The National Lead Company have awarded a contract for the erection of a two-story factory, 227 by 51 feet, at its plant in Brooklyn. A. J. Blaustein, who does contract work in soldering, engraving and plating, has removed from 25 Great Jones street to 529 Broadway.

The International Nickel Company has declared a dividend of 2½ per cent. on the common stock, payable March 1. Three months ago a dividend of 2 per cent. was declared. The regular quarterly dividend of 1½ per cent. on the preferred stock was also declared, payable February 1. The company state that the nickel business is exceedingly good, about 32,000,000 pounds of nickel are made a year, approximately 50 per cent. of which is used in armor plate and munitions of war and the remainder for commercial purposes. Plans are under consideration to enlarge the capacity of the company's refinery at Constable Hook, N. J.

It is peculiarly fitting that the National Automobile Show in Madison Square Garden and Grand Central Palace, January 11-25, should be the greatest exhibition of its kind, for it heralds the time when 1,000,000 automobiles will be in use in the United States, and, what is more important, without the slightest indication of any decrease in demand for the wonderful vehicle that has become so important a part of our modern civilization. Trade authorities admit, however, that there are now 825,000 cars in actual use in this country, of which 270,000 were made and sold during 1912. Few persons have any idea how rapidly gasoline and electric delivery wagons and trucks are coming into use throughout the country. There are estimated to be 50,000 in use in America at the present time, and, basing prediction upon the increase shown, the number will be nearly doubled during the year 1913. All told, there will be 702 exhibitors in the two buildings for the two weeks. Part I., during which pleasure cars, accessories and motorcycles are to be shown, will show 467 exhibits. Part II., which is to house commercial vehicles and accessories, will have over 250 exhibitors. In the Garden 42 makers will display pleasure vehicles the first week, while the Palace has a greater number—46 all told.

The exhibit of the National Machine Tool Builders' Association will be held in Madison Square Garden during the second week of the automobile show, beginning January 20. The exhibit will show the turning out of automobile parts in a most interesting manner. Rough castings will be cut down to the finished product. There will be automobile turret machines, boring, grinding, drilling, portable electric drilling, grinding and welding machines. Watching the operations of these modern machines will be decidedly interesting not only to engineers and mechanics, but to the general public who have never seen the inside of an automobile factory and do not know how automobiles are made. Some of the exhibitors of parts and accessories in other sections of the Garden will show products made right there in the building at the machine tool exhibit. In addition to the exhibit of various operations there will be a model stock room fitted up to house finished and unfinished parts.

The Damard Lacquer Company of America, manufacturers of Damard lacquer and cleaning solutions, have moved their offices from 1170 Broadway to the Aeolian Building, 29 West Forty-second street. The Reliable Refinishing Company, who make a specialty of refinishing metal goods in Damard lacquer, have moved their plant to 545 West Forty-second street.

NEWARK, N. J.

JANUARY 6, 1913.

Newark is noted as the largest high grade jewelry manufacturing center in the country and a dozen or so new firms have started in during the past year. Many have made improvements or built new factories. The trade is constantly expanding, but manufacturers are not making much money. The new ones starting in the same business and have merely cut into the profits of some of the large firms. In talking with many of them, almost to a man they say the past year has been a very dull one in jewelry and silverware as well as metal novelties. Particularly the high grade lines have been affected, for the sale of cheap goods have been quite good. None of them want any tariff reduction on any of these lines. If there was to be any reduction at all the real high grade diamond and platinum lines could stand it the best, as the profit is larger and the largest item of manufacturing cost is labor, while in the cheap lines the greater cost is gold or silver. But the tariff fixers say they want to reduce the tariff more on necessities and not on luxuries. The European countries and Japan can dump jewelry, high grade and cheap grades, in this country at such low prices that there would be no chance of competing at all, should the tariff be lowered to any great extent.

Cheap plated and 10-karat gold jewelry demand has been good this year and the makers have been quite busy. The manufac-

turers of 14 and 18-karat goods have been very quiet and have in many cases abandoned the making of these lines, owing to the competition of the 10-karat goods and the high grade platinum lines. Platinum jewelry has sold very good, too, but not as strong as the year before, as it is getting so now the public can not be sure of getting platinum goods, as there is no standard, such as in gold and silver manufacturing and the platinum is alloyed largely with silver and nickel, instead of iridium and other higher priced metals. If an article is stamped the karat gold or sterling silver one is pretty sure of getting what is right, but a standard for platinum is necessary.

The smelting and refining interests here have gradually enlarged each year and there is now a considerable amount of business done. The platers have done very well as there is quite a strong demand for plated goods, although most firms have their own plating plants. The firms selling supplies to the platers have had a good year. Watch case materials have had a quiet year. The manufacturers of watch cases have also slowed up some, as the sale of watches is not as strong as formerly. Machinery, tool and die makers have had a fairly good year.

The price of platinum has been advancing all the year and shows great strength. In manufacturing jewelry a couple of years ago where this metal was used only the points of rings and pins were made of it, but now the entire article is made of it, even brooches, rings, la vallieres, chains and watch cases. There is considerable demand for hand-made jewelry, more than for years. Jewelry made by the thousand from a die does not show the personality of the maker, like one can see in hand-made goods. Many prefer hand-made to machine made. Sterling silver and German silver lines have had a fair sale, and the trade in all kinds of novelties made of brass, bronze, aluminum, white metal, etc., has been very good. The value of sterling silver has been going up for some time and the manufacturers of flat ware have advanced prices 10 per cent. in consequence. It is expected that hollow ware and novelty makers will also raise their prices.

Many improvements have been made to the factories this year, and quite a number of new firms have started in. The business is broadening out every year and the output as a whole is probably greater than ever. Platinum lines continue as a leader, it being more costly and exclusive, while the 10 karat lines are in strong demand for the cheaper goods. The demand for 14 and 18 karat goods have fallen off a great deal, platinum taking their place.

The Keystone Watch Case Company, of Philadelphia, have moved here and combined their business with the Crescent Watch Case Company. They make solid gold and filled cases. The plant here has been improved and modernized. Since the death of Richard G. Frisch, the business of Frisch Brothers, manufacturing jewelers, has been in entire control of Charles W. Frisch. They are getting out a new line of bead necklaces. The Electrolytic Art Metal Company, of Trenton, moved to their new factory building at Beatty and Adeline streets. William H. Mattheson, formerly superintendent of the Ingersoll-Trenton watch factory, Trenton, is now with the New York Standard Watch Company of Jersey City. Stumpf & Binder have started to make 14 karat rings, swivel and platinum chains, in the Richardson building. Philip Stumpf and Hugo Binder were both with Carter, Howe & Company. They also intend to do plating and coloring.

Henry Ackerman, who was with Larter & Sons, opened a shop to do chasing, in the Richardson building. He also teaches the class in chasing at the Newark Technical School. Chris. Meister, the engraver, moved from 9 Franklin street to the Richardson building. E. H. Eastwood, manufacturing jeweler, moved from 30 Beecher street to the Lelong building, on Marshall street.

Peter McDonald, late with the Thomas J. Dunn Co., of New York, started in business here with George J. Bessinger, in the Richardson Building, making gold badges, emblems, etc. The Domestic Stone Company, of Arlington, moved there from Attleboro, Mass., and make a general line of links and jewelry. They have made many improvements to the factory. Eugene Gaffney is the foreman, and J. W. Luther represents the firm in Attleboro. The Balbach Smelting & Refining Company were at first assessed this year at $500,000, which they had reduced to $250,000. Last year the assessment was $130,000.

Thurstans & Walters tripled their jewelry plant by moving into larger quarters in the Richardson building, where they were located before. Charles Becker Company have discontinued the making of gold chains for the jobbing trade and are now making for the chain manufacturers. The facilities of the plant have been greatly enlarged. Have installed automatic chain making machinery, which has largely increased the output. Deed & Lynd Manufacturing Company of Albany, and L. E. Lynd of Mechanicsville, N. Y., have bought the Consolidated Casting Company, formerly the W. F. Greene Company, at the latter place, and will continue manufacturing store trimmings, piano hardware, etc. They have put in a lot of equipment necessary. The Ingersoll-Trenton Watch Company of Trenton, have built an addition to their factory, of concrete and brick, with outside fireproof stairways, to be used in case of emergency. The factory has been remodeled, new machinery put in, and an $8,000 sprinkler system installed, the factory employs about 500 hands and the watches are shipped all over the world. The "dollar watches" are made at Waterbury, Conn., while the 7 to 15-jewel watches are made at Trenton. They have 100 salesmen on the road. A new watch is to be made and the company also expects to make their own cases. Other enlargements are planned, which will greatly increase the output. George F. Eberhard is the new general manager and Thomas Barton the superintendent.

Henry Ringhof, formerly for fourteen years, with the Geo. Zucker Company, manufacturers of polishing and buffing compositions and before that for nine years with F. W. Gesswein, jewelers' supplies, is now located in the Essex Building, where he will be glad to hear from any concerns who desire to secure polishing supplies of any kind.

The Eclipse Air Brush & Compressor Company, 216 High street, have installed a complete plant for japanning, lacquering and enameling and are prepared to undertake job and contract work in this line. This plant is also used for demonstrating Eclipse air brushes.

Baker & Company, manufacturers of platinum wire and specialties, have had plans prepared for a new plant, 50 x 188 feet, on Murray street. The building will be three stories and basement, and is estimated to cost $80,000.

The Balbach Smelting and Refining Company are now engaged in building a new lead refinery on their Newark Bay property, the same to commence operations about July 1. This concern operates a lead refinery, in connection with which they smelt gold and silver materials; also a copper refinery and smelter.

For the fourth time within four years part of the loft building at Washington and Crawford streets, occupied mainly by manufacturing jewelers, suffered from fire, on December 24. Owing to efficient work on the part of the firemen the fire was confined to the fourth floor, which is occupied by Allsopp & Long. Their loss will be about $4,000, and is covered by insurance. They have secured temporary quarters at Camp and Orchard streets. A number of other concerns suffered small losses from smoke and water.

A fire of unknown origin swept through the Ruesch Building, 401 Mulberry street, about a month ago, causing more than $100,000 damage to building, machinery, fixtures, stock, etc. The following jewelry concerns were burned out: William Link Company; Schmitz, Moore & Company; Myer & Gross; the Climax Mesh Bag Company, and William J. Bailey, Inc. Other firms were caused losses by smoke and water. Since the fire considerable work has been done on the building, and all of these concerns hope to be again running before the first of February.

The American Aluminum Company is the new name of the Metal & Aluminum Specialty Manufacturing Company. They have moved to their new four-story factory at 374 Jeliff avenue, and with much larger facilities expect to considerably increase their output.

Some of the firms here are talking more than ever of working up an export trade, when the Panama Canal opens. There is no reason why a trade can not be worked up in the South and Central American countries, mainly in competition with Germany. It takes intelligent action, finding out just what they want, how they want the goods made, how shipped and the terms. The latter item is by far the most important, as in these countries long time credit is expected. The principal drawback to expansion of American trade in foreign centers is the fact that American shippers invariably look for settlement against B/L. It would not be a bad idea for the manufacturers to get together and send some travelers in those countries who understand the languages and customs.—H. S.

PHILADELPHIA, PA.

JANUARY 6, 1913.

The past year has not been a record-breaker but has been fairly good in the lines covered by THE METAL INDUSTRY. The output has been restricted somewhat by the generally slack conditions in all lines of trade. Prices have been fairly well maintained, although raw materials and labor has been advancing. Collections have not been as good as might be at times, but the financial troubles have been few. Many are expecting about the same conditions for the coming year of 1913 as the talk of a reduction in the tariff generally will have a bad effect on this city. Philadelphia is a large manufacturing point and, if these protected industries are hit it will cause a much worse condition than has prevailed in the past. Workmen in this city get good wages and will not consent to their wages being reduced from $3 a day down to 50 cents or $1, and the manufacturer paying high wages says he can not begin to compete with the cheap labor of Europe and Japan. Japan is already sending to this country very large shipments of goods that local manufacturers can not even come half way and compete. This tariff agitation has already had the effect of curtailing the buying of the manufacturer, jobber and retailer which has resulted in less manufacturing and less demand for raw materials.

The workers in brass and bronze and the foundries have taken a hopeful view of the situation and have worked steadily, creating sentiment favorable to their lines. Novelty manufacturers have reported a moderate demand for goods. Platers have noticed a falling off in the trade of those doing a general trade with the public, as the large factories have installed plants of their own. Brushes and buffs have sold about as usual. The jewelry and silverware manufacturers have had a quiet year on the whole. The jewelry district has, however, been polished up some and the streets present a better appearance since improvements have been made. It is the wish of all that business would open up strong this New Year as we have now had five years of quiet trade.

J. W. Ewing, who was with the Keystone Watch Case Company, has opened a factory in the Bowes building, to make engine turner and other high-grade jewelry. This is the only engine turning factory here.

The Manufacturing Jewelry Company have moved to new quarters, in Room 305, Times building. The William C. Bohrer Company, lapidarists, 729 Sansom street, have bought out the business of William Bohrer, at Seventh and Sansom streets. T. W. Hitchcock, engraver for the trade, will occupy the entire second floor at 11 North Thirteenth street and add watch and clock repairing. F. L. Davis, of 5147 Market street, has designed a new blower for his electric polishing lathe.

J. M. Keller has refitted his repair shop for the trade and put in more machinery, at 9 South Sixtieth street.

White & Bro., smelters and refiners of copper, Station K, Philadelphia, Pa., announce that their new office building at their Bridesburg, Pa., refinery is nearing completion. The building measures about 40 by 60 feet, and is of steel and concrete construction and thoroughly modern in every particular. White & Bro. report a steady increase in their business and that they are doubling their furnace capacity.

The Atco Metal Manufacturing Company, Atco, N. J., has been consolidated with the Penn Rivet Manufacturing Company, of 1115 Cambria street, Philadelphia. The J. W. Paxson Company, manufacturers of foundry supplies, 1021 N. Delaware avenue, gave their annual exhibition, December 26-31, of lantern slide views of the Panama Canal, and the latest improvements in foundry equipment.

The following is part of the interesting statement issued by the Merchant & Evans Company, regarding the course of their business in 1912:

"As a manufacturer of tin and terne plates, ventilators, metal tiles, metal shingles, solder, babbitt, newspaper metals, automobile parts, and as a jobber in materials generally used by metal workers, machinists, foundries, ship, car and engine builders, electrical workers, hardware and stove dealers and automobile manufacturers, our experience is somewhat more varied than exists with the average tin plate jobber and manufacturer. The condition of our business, as compared with business one year ago, shows a marked improvement. In some departments the increase has been over 100 per cent. In sheet metals single orders were received approximating 500,000 pounds. In mixed metals individual contracts of $100,000 were arranged. Our brass and copper business exceeded expectations. In clutches and other parts for gasoline commercial vehicles, our volume of business kept abreast if it did not actually exceed the rapid development in this important industry. The volume of our business in 1912 we conservatively estimate as at least 30 per cent. greater than in 1911. Both prices and profits were on a higher level. All our plants in Philadelphia, Chicago and Warwood are now running full time. Prospects for business in 1913 appear to us most favorable."—H. S.

PITTSBURGH, PA.

JANUARY 6, 1913.

During the first nine months of 1912 there was a sagging tendency in the brass and bronze lines, which was due to the dullness in other trades and the curtailing of orders. Business picked up some during the last three months. The demand has been better and the feeling more optimistic. This is not a large center for the manufacture of any gold, silver or platinum lines, although more is used each year. There have been efforts at times to increase the production of these lines. Pittsburgh is a good jobbing center, has the largest terminal facilities in the world and is the natural outlet to the States directly south and business is increasing. The new year holds forth promise of a very good business in the metal lines of trade. These lines are very strong and increasing.—H. S.

COLUMBUS, OHIO

JANUARY 6, 1913.

The year 1912 was a good one in almost every respect in metal circles in the Buckeye capital. The market, while not so active during the early months, took on more strength as the year advanced and closed fairly strong. There was a slight weakness at the close, which is attributed to the national election and the talk of tariff tinkering, the weakness, however, was not very marked and only had the effect of putting the market on a more sound basis. After the middle of the year there was quite a noticeable expansion in manufacturing generally in Columbus and central Ohio. While this was noted in every line it was especially prominent in metal manufacturing. In the copper market, good quotations prevailed throughout the year. The price was very satisfactory, and most of the dealers report a good volume of business, which was considerable in advance of that of the previous year. In the aluminum trade there was even more activity and prices ruled firm during the twelve months. In babbitt there was a good demand, as printing and allied industries were good. Smelting metals were also in good demand generally.

During the year there was a goodly increase in the number of manufacturing concerns which were users of metals. One of the features of this expansion was in concerns making automobile accessories. A number of such concerns were started and all proved good customers for metals of various kinds. The John W. Brown Manufacturing Company, a large manufacturer of automobile lamps, has secured the contract to supply the Ford Automobile Company with all lamps for the coming year, and this means a large metal demand. While there is some doubt as to the policy to be adopted by the coming Congress relative to the tariff, this is not taken very seriously, and on the whole the outlook for the coming year is bright in every particular. Metal men are getting busy on contracts for 1913, and the indications are reported bright in every quarter.

The big factory buildings of the Columbus Machine and Tool Company being erected on Marion Road are nearing completion, at a cost of $200,000. The McClintock-Marshall Company is doing the work. The buildings are of steel and brick, and consist of factories, office building, warehouses, etc. The Regle brass foundry, manufacturers of plumbing brass goods, Marysville, Ohio, has nearly completed its new plant. They have a foundry, machine room and plating department. The Philip Haas Company of Dayton, manufacturers of plumbing specialties, are erecting a four story addition to their plant, at a cost of $15,000.

The Buckeye Aluminum Company, manufacturers of "real solid" aluminum cooking utensils and many other specialties, Wooster, Ohio, have recently completed an addition to their melting room in the foundry department 24 x 50, completed a wareroom for packing supplies, etc., 40 x 70. They are now erecting an addition to their main factory, being the same construction as the present building, which will more than double their capacity. This latter improvement they expect to have ready and in action by March first.—J. W. L.

DETROIT, MICH.

JANUARY 6, 1913.

Brass and aluminum manufacturers in Detroit have ended one of the most successful years in the history of the industry. With the close of 1912 two years of great prosperity have been experienced by every manufacturer engaged in this industry. This is an unusually long period of continuous business activity without a hitch. With the opening of 1912 much apprehension was felt for the future. Manufacturers were facing the uncertainty of a presidential election with its usual depression. For once these fears proved groundless and not even a ripple was seen as time for the great national event rolled around.

One disagreeable feature, however, has been the cause of much anxiety among manufacturers in Detroit during the last year. Notwithstanding strenuous efforts put forth by railroads and shippers, it has been impossible for brass and aluminum, as well as manufacturers in other lines, to obtain sufficient facilities for transporting finished products. Many times during the year, and especially during the severe winter weather there was even danger of a coal famine. Manufacturers were compelled to continue cautiously and at one time a number served ultimatums on the railroads that, unless conditions were improved, they would be compelled to move to some other city. Threats like this soon had the desired effects and all through the summer and fall, railroads entering the city have been improving conditions by increasing terminal facilities. Twice the capacity is now available, and shippers who have been careless about unloading cars promptly, have been educated to a point where much of the difficulty has been overcome. But even now manufacturers are uneasy regarding conditions as the great majority of plant managers are preparing for greatly increased outputs. Thousands of men usually laid off in the brass, aluminum and automobile industries during the winter will continue at work. The Ford automobile factory, probably the greatest consumer of brass and aluminum in the country, is employing ten thosand men and has for many months. These will continue throughout the winter. The Packard Automobile Company employes seven thousand men, Publicity Manager Eastman announced this week. This force will continue indefinitely. The Michigan Copper and Brass Company, the Clayton Lambert Company, the Pemberthy Injector Company and, in fact, all the other large brass and aluminum manufacturing concerns report heavy business for the last year.

In a decision by the Interstate Commerce Commission December 27, 1912, in the case of the Michigan Copper & Brass Company and others against the Duluth, South Shore & Atlantic and other railroads, it was held that the rate from the upper peninsular of Michigan to Detroit was discriminatory as compared with the rate to New York City. While it was stated that the present rate to Detroit in itself was not unreasonable the roads were ordered to make a 10-cent differential between that and the rate to New York.

Prospects for another big year are as bright and even brighter than they were at the beginning of 1912. One man interested in the trade this week declared not even a cloud was seen in the Detroit business horizon. Manufacturers in all lines of the business are preparing for continued heavy business and no one doubts that the coming year will be the best in the history of the city. The manufacturing jewelers have just closed a good year; the Christmas trade particularly was unusually heavy. No particularly new novelties have been placed on the market, but the high class of goods that have been produced in Detroit and the west during the last year have met with favor even in the east, where it has been supposed manufacturers in this line take the lead. The western manufacturers are rapidly coming to the front, and soon will be close competitors with eastern houses.

Frederick B. Stevens, manufacturer of foundry facings and supplies, Detroit, gave a dinner January 7, at the Wayne Hotel, to twenty members of his selling force. W. H. Joseph Cluff presided as toastmaster, and requested a five-minute talk from each member upon the subject of "Co-operation." This topic was analyzed into all its possible applications, including the family, the business and the civic good. To be in accord with fraternal organizations, commercial organizations, and that the attractive features of all might be incorporated, constitution and by-laws were adopted, together with "signs, words and symbols." The mystic sign is that of the "Elephant's Eye."—F. J. H.

LOUISVILLE, KY.

JANUARY 6, 1913.

The year which has just closed was one in which, from July on, a steady increase in the general volume of business in all lines was experienced, making the last six months a period of extraordinary commercial activity; and the metal trades were no exception to this. This fact is especially remarkable in view of the fact that the past fall witnessed a presidential campaign of unusual warmth, and an election in which the downfall of the ruling party was almost a foregone conclusion. The "presidential year" bugaboo seems to have so far ceased to be a thing to frighten; however, business proceeded on its upward way totally without reference to political conditions; and it is still doing so. The possibility of tariff changes, or, rather, the probability of legislation along that line, is having, and indeed, can have, but little effect upon the business of the Middle West. This section has harvested tremendous crops; building activity was never greater, and all of those industries in which copper and the other metals are used have been taxed to their utmost to keep up with demands.

A specific instance, of particular interest to the metal industry, is the effect which the season's bumper corn crop has had locally. The resulting low price of the cereal has operated as a powerful inducement to whiskey manufacturers in Kentucky, who consume from 12,000,000 to 15,000,000 bushels of corn in a season such as this, to begin operation early. A direct consequence of this, locally, was a rush of business with the manufacturers of distillery equipment. There are several of these concerns in the city of Louisville alone, which supply practically the entire South, sending goods clear to the Gulf; and since the early fall they have been working overtime, almost literally, in an effort to meet the demands from the distillers for new equipment and for overhauling and repairs of old.

This particular phase of the local situation, therefore, which is peculiar to this section, with the general activity in the trade which has been noted, and which reflects conditions elsewhere, is in harmony with the causes which resulted in the steady rise in the price of sheet copper from the low mark of 16½ cents early in the summer to the present high price of 23 cents; but so far from this figure discouraging business, as it might have been expected to do, it has had no appreciable effect on the local demand. The plumbing trade has been particularly brisk, and the consumption of copper and brass in this line has been correspondingly large. The local plant of the Standard Sanitary Manufacturing Company, manufacturing all kinds of plumbing and bath-room equipment, has done a larger business than ever before in its history, and has used more metal in the doing of it. The tremendous building activity which has been a feature of 1912 had its share in the making of prosperous conditions in the metal trade. Sky-scraping office buildings, hotels and apartments, with their multifarious needs in the way of equipment and fittings of copper, brass, and other metals, have been erected, and dealers in these lines have been correspondingly busy and happy.

Trade in the precious metals, according to the manufacturing jewelers of this vicinity, has never been better. From New Year's to Christmas things have been exceptionally prosperous with this trade, and the holiday season just past was one of the most active ever experienced here. In common with all other metal workers, the jewelers are entering the New Year with an optimism born of the knowledge of good business behind, and unclouded prospects for even better things in the future.—G. D. C.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The Acme Brass Foundry, Los Angeles, Cal., has let a contract for a new plant at the town of Torrance.

The Remington Arms & Ammunition Company, Ilion, N. Y., are building an addition to their plant.

The Norwalk Brass Company are now located at South Norwalk, Conn., having recently moved their plant from Norwalk.

The Northwest Brass Foundry Company, Ltd., Calgary, Alberta, Can., will build a plant for the manufacture of brass goods.

The United States Brass & Iron Foundry Company, Chicago, Ill., will erect a new factory building, 75 x 200 feet, on West Kearsley street.

The Bristol Brass Company, of Bristol, Conn., have closed out their cutting-up department to the National Marine Lamp Company, of that city.

The Buckeye Iron & Brass Company, Dayton, Ohio, is having plans prepared for a new five or six-story plant of concrete construction about 100 by 100 feet.

The Galion Brass & Bronze Company, Galion, Ohio, notice of whose incorporation was published in our last issue, will erect a foundry 40 by 100 feet.

On December 16, 1912, Frank G. Crane was appointed receiver of The Toledo Metal Spinning Company, Toledo, Ohio, with instructions to wind up its business.

The Fort Brass Foundry Company has been incorporated at Nashville, Tenn., by James B. Fort, Frank Foster and Louis N. Fort, and will operate a foundry with a daily capacity of eight tons of metal.

A patent for a carboy rocker, No. 1,048,493, was issued to Seth C. Catlin, Bloomfield, N. J., on December 31, 1912, by the U. S. Patent Office. Rockhill & Vietor, 114 John street, New York, are the selling agents for this carboy rocker.

The plant of the Port Washington Brass Works, Port Washington, Wis., was destroyed by fire on December 31, causing a loss of about $2,500. Defective wiring was the cause of the destruction of this factory which will be rebuilt.

The Riverside Foundry Company, of Kalamazoo, will erect a new galvanizing plant, 50 by 80 feet, which with the present factory will make theirs the largest galvanizing plant in Michigan. This concern specializes in galvanized castings for the manufacturing plumbing trade.

The Quigley Furnace and Foundry Company, manufacturers of furnaces and complete furnace equipment for all industrial requirements, Springfield, Mass., are now operating the foundry of the Bausch Machine Tool Company, but expect to move into their new plant about March 1.

The Southern Art Metal Company has been organized at Americus, Ga., with an authorized capital stock of $100,000, with the purpose of manufacturing sheet metal products. The officers are C. C. Hawkins, president; L. W. Rose, vice-president and general manager, and W. G. Hooks, secretary and treasurer.

The Charleston Foundry & Machine Company, formerly of Phillipi, W. Va., have removed to Charleston, W. Va., where they will make brass castings. The National Supply Company have recently started a large brass foundry at Hagerstown, Md. This concern also has a branch at Curtis Bay, Md.

The Piedmont Brass Works, of Charlotte, N. C., which is a subsidiary of the Blake Car Step Company of that city, is installed in its new building, which measures 130 x 30 feet, and is specially equipped for turning out brass and aluminum castings. The company has on hand a large amount of work for automobile manufacturers, in addition to its other contracts.

E. J. Fitzgerald, for seven years general manager of the Illinois Pure Aluminum Company, has obtained an interest in the Aluminum Products Company, La Grange, Ill. This concern has started the erection of a plant at Lemont, Ill., from which plant they will manufacture a complete line of heavy aluminum cooking utensils. W. A. Hastings is general manager.

The Colonial Brass Company, founders and finishers of aluminum, copper, brass and other alloys, New Haven, Conn., were among the firms whose plants were destroyed by a $100,000 fire on December 11. Fred H. Page, president of the company, states that they are now located in a new plant at 598 State street, where they have very much larger facilities and are prepared to take care of all orders.

The Southern Aluminum Company, Whitney, N. C., a complete account of whose plans was published in the November, 1912, issue of THE METAL INDUSTRY, state that they are now engaged in the development of water power on the Yadkin river at Whitney, and are erecting works for the manufacture of aluminum. They estimate that it will take from twelve to eighteen months for them to reach the producing stage.

Theodore E. Daub, secretary of the Hawley Down Draft Furnace Company of Easton, Pa., reports that the company has been reorganized and has purchased the entire property, business and franchise, including patents, drawings and patterns of the Hawley Down Draft Furnace Company of Illinois, and with increased facilities are in a position to furnish promptly Schwartz and Hawley down draft metal melting furnaces, as well as all repair parts for the same.

The Taylor Instrument Companies, manufacturers of thermometers and pyrometers, Rochester, N. Y., are erecting an addition to their plant 40 by 300 feet, facing the present building, which will be used entirely for office purposes. An additional story will also be added to their main building, and this, together with the space to be vacated by the present offices, will greatly increase their manufacturing facilities. The plant at present employs between five and six hundred people.

The Volunteer State Mineral Company has been organized at Nashville, Tenn., with a capital stock of $50,000, to operate the large tripoli deposits at Bristol, Va.-Tenn., where it will have a plant on the Virginia side of the city. The officers are S. L. Hudson, of Smyrna, Tenn., president; Edward B. Tucker, vice-president; E. C. Holloway, secretary-treasurer; Dr. I. Steinberg, Nashville, manager. The manager is receiving bids on the necessary machinery for producing the polishing material for which tripoli is most valuable.

The Albert Russell & Sons Foundry & Machine Works, of Newburyport, Mass., which was founded in 1838, has the distinction of still occupying the site selected by its founder, though the plant has increased in size many times. This concern originally made pumps and windlasses for ships, but, as this line of work declined, the character of the plant was changed to embrace general machine work and castings of every description. The latest addition was that of bronze casting, and this concern has secured many government contracts for bronze tablets for the battlefields of the South.

Following its usual custom, the H. Mueller Manufacturing Company, of Decatur, Ill., handed out Christmas presents to about 1,000 of its employees. A majority chose a basket containing a ham and side of bacon. The combined weight of the hams and bacon was about 13,000 pounds. Other presents included magazines, cigars and handkerchiefs. The school for traveling salesmen opened on December 31 and remained in operation for about two weeks. Nearly fifty

salesmen attended the sessions at which a number of helpful papers were presented and discussions indulged in.

The Genesee Metal Company, Rochester, N. Y., report, through F. W. Reidenbach, general manager, that during 1912 they made several improvements to their plant; one being a new addition 37 by 77, one story for storage purposes. A power shear for preparing metals in crucible shape, thus making a more acceptable commodity for the trade and a bricking machine that enables them to put into crucible shape new brass and copper clippings and wire, were added. These improvements, together with their equipment for the manufacture of spelter, pig lead, ingot brass and bronze, and their dross reducing furnaces place them in a position to promptly and satisfactorily take care of all orders. They state that the outlook for 1913 is exceedingly promising.

The Poughkeepsie Brass Foundry, Poughkeepsie, N. Y., whose plant was destroyed by fire on November 28, 1912, as reported in our issue of December, 1912, report, through F. R. Williams, secretary, that they have fitted up a foundry at 380 Mill street, in a brick building that was formerly a foundry, and office and coke and shipping building have also been built close by. They have put in a No. 225 Ideal furnace and have two No. 125 on the way that will be set up and running in another week, so that their production will be about 6,000 pounds per day if necessary. Their new quarters will take care of them for some time and the question of building a new foundry will be acted upon probably within the next two months, as they have several locations in sight, but nothing definite has been decided upon.

G. J. Nikolas & Company, manufacturers of high-grade lacquers, 1227 W. Van Buren street, Chicago, report, through G. J. Nikolas, Jr., that they have during the past year installed fifty large steel glass enamel storage tanks, which increased their storage capacity to 300 per cent., enabling them to carry 30,000 gallons of finished lacquer, and have also increased the capacity of their distilling plant 200 per cent., which will enable them to take care of their rapidly increasing trade. They have added to their list of products the "Nikolas Acid Proof Lacquer," which is imprevious to 66 per cent. sulphuric acid, 28 per cent. C. P. ammonia, alcohol, acetone and similar products. This lacquer differs from any other product now on the market in many material respects. A line of lacquer enamels, that they can furnish in all colors, has also been introduced. The verde antique lacquer enamel will produce a beautiful verde antique finish without the use of chemicals. The work is first oxidized and then lacquered. They state that their sales for 1912 exceeded those of the previous year by 40 per cent.

FOREIGN TRADE OPPORTUNITIES

(In applying for addresses at Bureau of Foreign and Domestic Commerce, Washington, D. C., refer to file number.)

No. 10142. Lead.—An American consular officer in a European country reports that a municipal waterworks is in the market for 22,046 pounds of lead. Further details can be obtained by corresponding in English with an engineer named in the report.

No. 10155. Copper, brass, bronze and iron manufacturers.—An American consular officer in Italy reports that a local firm desires to represent on the local market American manufacturers of the following lines: Aluminum plates and ingots, brass and bronze ingots, copper ingots and tubing of large sizes, iron and brass tubing especially adapted for metal beds, the tubing to be square and not round. The firm is said to be in a position to push the sale in Italy of the above lines and can furnish references. Correspondence in English, Italian or French.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

The Stamford German Silver Company, Stamford, Conn., Capital, $75,000. Incorporators: W. B. Beckley, G. C. Harrison, J. G. Mackay, all of Stamford.

The Victor Brass Manufacturing Company, Cleveland, Ohio. Capital, $20,000. To manufacture brass castings. Incorporators: W. H. Mahon and others of Cleveland.

Camden Copper Works, Camden, N. J. Capital, $50,000. To manufacture copper articles. Incorporators: B. A. Ahlberg, W. J. Barrett and C. B. Wheaton, all of Camden.

The Pequot Brass Foundry, Norwich, Conn. Capital stock, $6,500. To manufacture brass and other metals. Incorporators: F. E. Green, E. A. Tracy, F. M. Green, all of Norwich.

Lafayette Silver Manufacturing Company, Newark, N. J. Capital, $100,000. To manufacture silverware. Incorporators: O. A. Vin, S. Buckew, J. A. Bernhard and C. M. MacMahon, all of Newark.

Aluminum Castings, Ltd., Ottawa, Ont. Capital stock, $40,000. To manufacture aluminum and other metallic products. Incorporators: T. H. Sedley, R. G. Code and Robert M. Kerby, all of Ottawa.

The Exel Plating & Manufacturing Company, Cleveland, Ohio. Capital, $10,000. To plate all kinds of metals. Incorporators: A. D. Levy, L. J. Kohn, J. F. O'Neill, E. E. Thomas and J. S. Kohn, all of Cleveland.

Pryibil Machine Company, Inc., New York. Formerly P. Pryibil. Capital, $120,000. To manufacture metal working tools and machinery. Incorporators: Albert Pryibil, Paul L. Pryibil and Charles B. Bauerdorf, all of New York.

The United States Molding Machine Company, Cleveland, Ohio. Capital, $10,000. To manufacture foundry molding equipment. Incorporators: J. M. Battenfeld, J. H. Griswold, G. H. Williams, W. E. White and J. A. Hadden, all of Cleveland.

PRINTED MATTER

Metals.—The Standard Rolling Mills, Inc., Brooklyn, N. Y., have issued a large calendar on which they call attention to their products, which include solder wire, britannia and casting metals, sheet block tin, strip lead and special compounds.

Neutrol.—The William Berkel Chemical Works, Jersey City, N. J., have issued a small folder stating the advantages of neutrol for all kinds of cyanide baths, together with directions for the use of same.

Die Molded Brass.—The Doehler Die Casting Company, Brooklyn, N. Y., have issued an attractive little folder giving descriptions and illustrations of their line of die molded products. Interested parties may obtain further particulars by writing for Bulletin D.

Trisalyt.—The Roessler & Hasslacher Chemical Company, New York, have sent out a neat little four page folder as a New Year's greeting, containing some pertinent claims for Trisalyt, the triple plating salt lately introduced by them.

Aluminum.—Facts and figures relating to aluminum and its alloys are contained in a neat little leather-covered booklet just issued by the British Aluminum Company, London. The booklet is in pocket form and sets forth the leading properties of the metal aluminum and also contains a complete list of the various forms in which the company can supply it. Copies may be obtained upon request.

Pumps.—The Bridgeport Brass Company, Bridgeport, Conn., have issued an attractive little twenty-eight page booklet, giving full descriptions and illustrations of the various styles of pumps manufactured by them. This line of Bridgeport pumps includes those used for automobiles, motorcycles and bicycles. A section of the catalog is devoted to the improved searchlight gas lanterns for the above machines.

Lead Rope.—The United Lead Company, New York, gives a complete description of their "Ulco" lead rope, which is made of a specially refined lead, in a little brochure just issued. This material is used for plumbers, gas and steam fitters, etc., and is manufactured in the form of rope with strands of finely divided lead. This produces a repair material available at once for leaks in gas, steam or water pipes or masonry.

Magnalium.—Is described in a small booklet recently issued by the Walker M. Levett Company, New York, who are prepared to furnish castings made of this material, which is an alloy of aluminum and magnesium. It is lighter than pure aluminum and is suitable for crank cases and covers, cylinders, pistons and other parts of machines where strength and lightness are desirable.

Roofing Materials.—The Ajax Lead Coating Company, Philadelphia, describe in a new catalog their new material which is a black plate coated first with zinc, and then having an added coat of pure lead. This material is said to be an ideal one for roofing and siding buildings and has been named Ajax Rust-Proof Sheets. A full list of sizes and gauges is included in catalog "A."

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

ADNEWS

Platers' Equipment.—The Bennett-O'Connell Company, Chicago, Ill., are featuring their new ball bearing polishing lathes, which they recently placed on the market. They also report large sales of their Excel-All low voltage dynamos which they state are giving universal satisfaction. Another line which is receiving their special attention is the manufacture of combination salts for various solutions, which require only the addition of water to make up the solution ready for work.

Carboy Rocker.—Rockhill & Vietor, 114 John street, New York, announce that a patent on their Nonesuch Carboy Rocker has been issued, and they warn manufacturers and users against infringement. The Nonesuch Carboy Rocker is an extremely simple, useful and inexpensive device, which can be used advantageously by anyone who is handling acids in carboys.

Lacquers, Soluble Cotton, Etc.—The International Smokeless Powder and Chemical Company, 140 Cedar street, New York, announce that they have added a lacquer department to their extensive plant at Parlin, N. J. Their line of lacquers is known by the brand "Ispacco." The International is the subsidiary company through which the well-known Du Pont Powder Company has been furnishing soluble cotton, amyl acetate and refined fusel oil to lacquer manufacturers for many years past. The history of the Du Pont Company is one of steady progress and expansion since they founded the explosive business in this country more than one hundred years ago, and their vast resources combined with their ample facilities should enable them to occupy a conspicuous position in the lacquer business.

Lacquers, Amyl Acetate, Etc.—The New Era Lustre Company, New Haven, Conn., Franklin S. Cobb, president and general manager, invite attention to New Era Lacquers—"made right, sold right, and guaranteed right."

Lacquer Sprayers.—The Eureka Pneumatic Spray Company have added a new model to their line. This sprayer is illustrated in their advertisement, and full information regarding it can be secured by writing to the company's office at 276 Spring street, New York.

Coke and Coal Furnaces.—The Ideal Furnace Company, Chester, Pa., invite the attention of readers to a report of furnace efficiency tests made at the Washington Navy Yard, which is published elsewhere in this issue.

Wire Straightener and Cutter.—"Wear Well—Work Fast is the slogan used by the F. B. Shuster Company, New Haven, Conn., in connection with their automatic wire straightener and cutter. This machine, they state, is so efficient that it pays for itself in a short time. They also make sprue cutters and other machinery, catalog of which will be mailed to those desiring it.

White Metal Testing Scales.—The Delaware Metal Refinery, Eighteenth street and Washington avenue, Philadelphia, Pa., announce that they are sole manufacturers of Richards Specific Gravity Scale for testing white metals. This company also manufactures solder, zinc and aluminum alloys.

Metals.—Bruce & Cook, 186 Water street, New York, have taken space in THE METAL INDUSTRY, which is devoted to their complete line of metals. This company was established in 1812, and is one of the best known in the metal trade.

Fuel Oil Burners.—The Stilz Company, 1938 North Marvine street, Philadelphia, Pa., show their new fuel oil burner, which they claim heats quickly and economically with a non-oxidizing fire. Metal users who write for it will secure interesting information on melting brass in open hearth furnaces.

Rouge.—The Oriental Rouge Company, 66-68 Pine street, Bridgeport, Conn., direct attention to their high grade rouges and invite metal manufacturers to send for samples.

Stoneware Plating Equipment.—The German-American Stoneware Works, 50 Church street, New York, point out some of the advantages of using their stoneware acid tanks, exhaust fans, dipping baskets, etc., instead of the ordinary apparatus usually installed.

Felt Polishing Wheels.—The Felters Company, 684 Broadway, New York, advertise in this issue their Eagle Brand felt wheels, which they claim will wear longer than ordinary wheels, because they are made of longer fibre wool and contain no sizing or other foreign substances, such as are sometimes used to improve the appearance of the wheel. They guarantee Eagle Brand wheels to wear longer than other makes. The Felters Company have offices at New York, Philadelphia, Chicago and Boston.

Polishing and Plating Supplies.—The "Reliance" dynamos, polishing lathes and a complete line of other platers' and polishers' supplies, are prominently featured in this issue by Charles F. L'Hommedieu & Sons Company, 24-30 South Clinton street, Chicago, Ill.

Polishing Compositions.—Acme Brand White Finish and other Acme Brand compositions are known all over the world where metal goods are made. These compositions are manufactured by the George Zucker Company, 202 Emmett street, Newark, N. J., whose advertisement in this issue gives further particulars regarding them.

Sheet Metal Slitter.—The Blake & Johnson Company, Machinery Division, Waterbury, Conn., illustrate their new slitter designed with the primary object of changing cutters in minimum time. A circular explaining the special features of this machine will be sent on request.

Polishers' and Platers' Supplies.—Henry Ringhof, Essex Building, Newark, N. J., announces that he would be glad to receive inquiries from platers and polishers for any supplies used in the polishing trades. He has a number of specialties and particularly desires to get in communication with concerns who need special compositions, etc., for special purposes.

Plating for the Trade.—On another page John Hassall, Inc., Clay and Oakland streets, Brooklyn, N. Y., call attention to their specialty of plating small articles for the jobbing trade and manufacturers of stamped metal goods, screw machine products, nails, tacks, rivets, etc. They have all the latest appliances for ball burnishing, tumbling, cleaning and drying, and are prepared to quote low prices on any work that can be plated in mechanical plating barrels. Prices will be quoted on receipt of samples.

Kiln Dried Sawdust.—The Lignum Chemical Works, Meeker avenue and Vandam street, Brooklyn, N. Y., show a picture in their advertisement of their enormous warehouse, used for the storage of various kinds of sawdust. They make Rock Maple Kiln Dried Sawdust in five grades of fineness; also boxwood sawdust and a special low cost sawdust for drying out ordinary work. Their facilities enable them to ship single sacks or carload orders anywhere. Metal goods manufacturers are invited to send for samples.

INFORMATION BUREAU

Any firm intending to buy metals, machinery or supplies, and desiring the names of the various manufacturers and sellers of these products can obtain the desired information by writing to THE METAL INDUSTRY, 99 John street, New York. Commercial questions are answered by return mail. Our Information Bureau is for the purpose of answering questions of all kinds.

METAL MARKET REVIEW FOR 1912—OUTLOOK FOR 1913

By J. J. Archer.

The year 1912 has more than justified the predictions made last January. In our review for the year 1911 and outlook for 1912 we said:

"For the coming year we feel that the basic conditions have never been better; the liquidation the nation has passed through has cleared the atmosphere. Prospects for 1912 are bright. The railroads have already ordered some of the material that was probably absolutely necessary. Money has never been cheaper than it is today, and confidence, the mainspring of all industry, is gradually being re-established, and the indications are that the business world is more than ready to go ahead."

With conditions at times most unfavorable, with a war in Europe and semi-panicky markets in all the European financial centers, and the consequent wholesale liquidation abroad of American securities, the business world of America has passed through one of the most successful years in the history of the nation. The Presidential election, ordinarily or traditionally an unsettler of business generally, was never even a feature.

Wall Street, still considered by the "Old School" as the barometer of the trade of the country, was positively ignored, forgotten, and more or less utterly discredited.

In Iron and Steel, in Copper, in fact in all metals we have had the biggest year in production and consumption ever recorded.

As a general criterion of increased trade, bank clearings for 1912 were $174,250,200,000 against $159,403,200,000 in 1911; that partly tells the story. In Iron and Steel, pig iron production was over 29,000,000 tons, against say 23,000,000 tons in 1911. In fabricated steel consumption ran far ahead of the ability of the mills to produce. It was less than two years ago we were told that the capacity of the mills was way ahead of any possible demand for years to come, and today steel mills are all behind.

The cause of all this trade expansion can be found in the enormous growth of the country; it is not any sudden growth, for the last three years the country has been growing while manufacturing trade has been practically standing still; that gives the whole story. Today conditions are as sound as ever and the outlook as bright as at any time.

COPPER.

The copper industry has at last learnt its lesson, for never before have the producing interests worked together for their mutual benefit as during the year 1912. It matters not whether one calls it a "Combination," "Agreement" or "Understanding," and it matters not that all these terms or conditions have been strenuously denied by the producers and selling agents themselves, it is abundantly evident that something does exist to hold the price of Lake copper at 17¾ cents, irrespective of the infallible law of supply and demand.

The copper market opened in January, 1912, after a rapid advance in December, at 14¼ cents for Lake, 14⅛ for Electrolytic, and 14 cents for Casting. On good buying for home and foreign account the price was gradually pushed up to 17¾ for Lake, 17⅝ for Electrolytic and 17½ for Casting. The home buying was good up to the time of the Balkan war, when all speculative prices declined in Europe and copper broke in London about £8 per ton. This break in London brought out cheap sellers of copper and close to 17 cents was done for Lake copper (the producers all holding firm at the pegged price of 17¾ cents), with better prices in London. Prices advanced again to close to 17¾ cents, and at the end of the year or early this year some good sales have been made at full prices, and the market today opened strong at 17¾ cents with the Copper Producers' figures. London market turned weak and declined £1, while prices here eased off nearly ½ cent per pound.

Statistics issued by the United States Geological Survey show smelter production from domestic ores was 1,249,000,000 pounds in 1912 against 1,097,232,749 pounds in 1911. According to the Copper Producers' Association the total production of refined copper for the year was 1,581,920,287 pounds, against 1,431,938,338 in 1911. The total deliveries for the year were 1,566,062,400 pounds, as follows: American deliveries, 819,665,948 pounds, exports, 746,396,452 pounds. The stock of merchantable copper on hand January 1, 1913, according to the Copper Producers' Association, is 105,312,582 pounds against 89,454,695 pounds a year ago, showing a decrease of some 15,000,000 pounds for the year.

The exports for the year were 746,396,452 pounds against 753,773,240 pounds a year ago. According to Custom House returns the exports for the year were 734,641,600 pounds, showing an excess by the Copper Producers' export figures of 11,754,852 pounds, this will have to be adjusted later. The imports for the year were about 404,721,323 pounds, against 334,607,538 pounds during 1911.

January 14. Since writing the above report the copper market has broken wide open, the "Combination" (that we have been writing against for months), has been smashed and today electrolytic copper is offered at 17 cents, with Lake at 17¼. The market is weak and unsettled, with buyers holding off.

TIN.

The tin market, as usual, during the year has been more or less controlled by the foreign syndicate. During the latter part of the year the Syndicate has not been much in evidence, and the market has been left to local issues. The price started at around 43 cents a year ago and advanced up to close to 48 cents in June, then came a big break in London, owing to the war, and prices dropped to around 44 cents, and from August to the close of 1912 the market was firmer and advanced to around 50 cents.

Statistically, the market is bullish rather than bearish; the total visible supply January 1 is 10,977 tons against 16,514 tons a year ago.

LEAD.

The United States Geological Survey estimates the total production of refined lead, desilverized and soft, from domestic and foreign ores, in 1912, at 480,965 tons of 2,000 pounds, as against 486,976 tons in 1911.

Of the total production the desilverized lead of foreign origin comprised 81,649 tons in 1912, as against 94,143 tons in 1911, 399,472 tons in 1911 and 376,021 tons in 1910.

The price in January was 4½ cents New York basis, the Trust

then cut the price 50 cents a ton to 4 cents New York, when the market reacted again on Trust manipulation and prices came close to 5 cents in September, after which continual cuts by the Trust brought the price to 4½ cents New York at the close of the year.

SPELTER.

The United States Geological Survey estimate the domestic production of primary spelter for 1912 at 323,961 tons of 2,000 pounds, as against 271,621 tons for 1911.

Including foreign ores the total production was 338,630 tons against 286,526 tons in 1911. The consumption is estimated at 339,793 tons against 280,059 tons in 1911 and 245,884 tons in 1910. The most interesting feature in these figures is the large estimated consumption for the year 1912. This probably accounts for the strong market and high prices during the year. There has been less manipulation of this market lately, and that is a good feature. The stocks of spelter at the end of the year are figured as 4,208 tons against 9,049 tons in 1911 and 23,201 tons at the end of 1910. The production increased 52,000 tons, but the consumption gained nearly 60,000 tons during 1912.

The market is firmer and there seems to be less disposition to discount future deliveries. The price today is around 7.35 New York and 7.15 East St. Louis, or about 1 cent per pound over the price of a year ago.

ALUMINUM.

The market for aluminum has been very active during the year. The leading interest was not able to fill the demand, and the foreign market had to be called on. The market is firm with advancing tendency today at around 26½ cents for domestic or foreign, against a 22-cent market a year ago.

ANTIMONY.

The antimony market during the year has had another periodical boom and prices were lifted over 2 cents per pound. The last boom in antimony was during the Russo-Japanese war, and now, with the Balkan fight, antimony again gets active and more or less uppish. Cookson's today is around 9¾ cents against 7¾ a year ago, Hallett's 9¼, and Hungarian grade 9 to 9⅛ cents—all grades showing an advance of about 2 cents per pound over last year.

SILVER.

The silver market has been quite active during the year, and new high levels have been reached. The market at the close is quotable at 29 5/16*d*. in London and 65⅝ cents in New York. This is 5*d*. higher in London and about 11 cents higher in New York than a year ago.

PLATINUM.

There has been very little change in the platinum market during the year. The wholesale price today is $48 per ounce for hard or 10 per cent., and for ordinary refined $45.50. Iridium (metallic) is quotable at $63 to $63.50 per ounce.

QUICKSILVER.

The market for quicksilver has been held steady at around $45 to $40 per flask for wholesale lots at the close.

SHEET METALS.

The price of sheet coppers has been advanced as the price of ingot was pushed up. The base price today is 23 cents, against 19 cents a year ago. Copper wire is quotable at 19 cents base against 15¼ cents a year ago. There is a good demand for all manufactured copper products, and the mills are most of them behind on their deliveries. All brass tubing and high sheet brass shows an advance of from 3 to 4 cents per pound base.

OLD METALS.

The old metal market has shared in the general prosperity, and holders of stock a year ago are just so much better off for the advance. Europe was a heavy buyer of all kinds of scrap copper early in 1911 when copper was selling at around 12 cents per pound, but during the latter part of 1912, with copper held at 17¾ cents, Europe was not as active a buyer as at the lower level. It is the same with ingot copper; Europe will buy very freely at around 12 cents, but at 17¾ cents Europe will only buy when she must and as she needs. Prices generally for scrap copper are about 2 cents per pound higher than those ruling a year ago.

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)
January 8, 1913.

Stocks of marketable copper of all kinds on hand at all points in the United States, December 1, 1912		86,164,059
Production of marketable copper in the United States from all domestic and foreign sources during December, 1912		143,354,042
		229,518,101
Deliveries:		
For domestic consumption	58,491,723	
For export	65,713,796	
		124,205,519
Stocks of marketable copper of all kinds on hand at all points in the United States, January 1, 1913.		105,312,582
Stocks increased during the month of December		19,148,523

DECEMBER MOVEMENTS IN METALS

Copper.	Highest.	Lowest.	Average.
Lake	17.75	17.50	17.70
Electrolytic	17.70	17.25	17.50
Casting	17.50	17.20	17.35
Tin	50.10	49.30	49.90
Lead	4.50	4.35	4.40
Spelter	7.40	7.30	7.40
Antimony (Hallett's)	9.50	9.25	9.40
Silver	64⅛	62¼	63.36

SHEET METAL MOVEMENTS YEARS 1910—1911—1912

Highest and lowest base prices (in cents per lb.) on sheet brass, sheet copper and sheet copper and German silver.

	1910.		1911.		1912.	
	High.	Low.	High.	Low.	High.	Low.
Sheet brass	15.25	13.25	15.625	12.75	18⅝	14⅜
Sheet copper	19.00	18.00	19.00	16.00	23	19
Sheet German silver, 18%	25.50	24.50	25.50	22.75	25¾	22¾

WATERBURY AVERAGE

The average price of lake copper per pound as determined monthly at Waterbury, Conn.:

1911—Average for year 12¾. 1912—January, 14½; February, 14½; March, 15; April, 16; May, 16⅜; June, 17½; July, 17¾; August, 17¾; September, 17⅞; October, 17¾; November, 17¾ cents. December, 17¾. Average for year, 16.70.

DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY for the sum of $10. The price of the Report alone is $10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

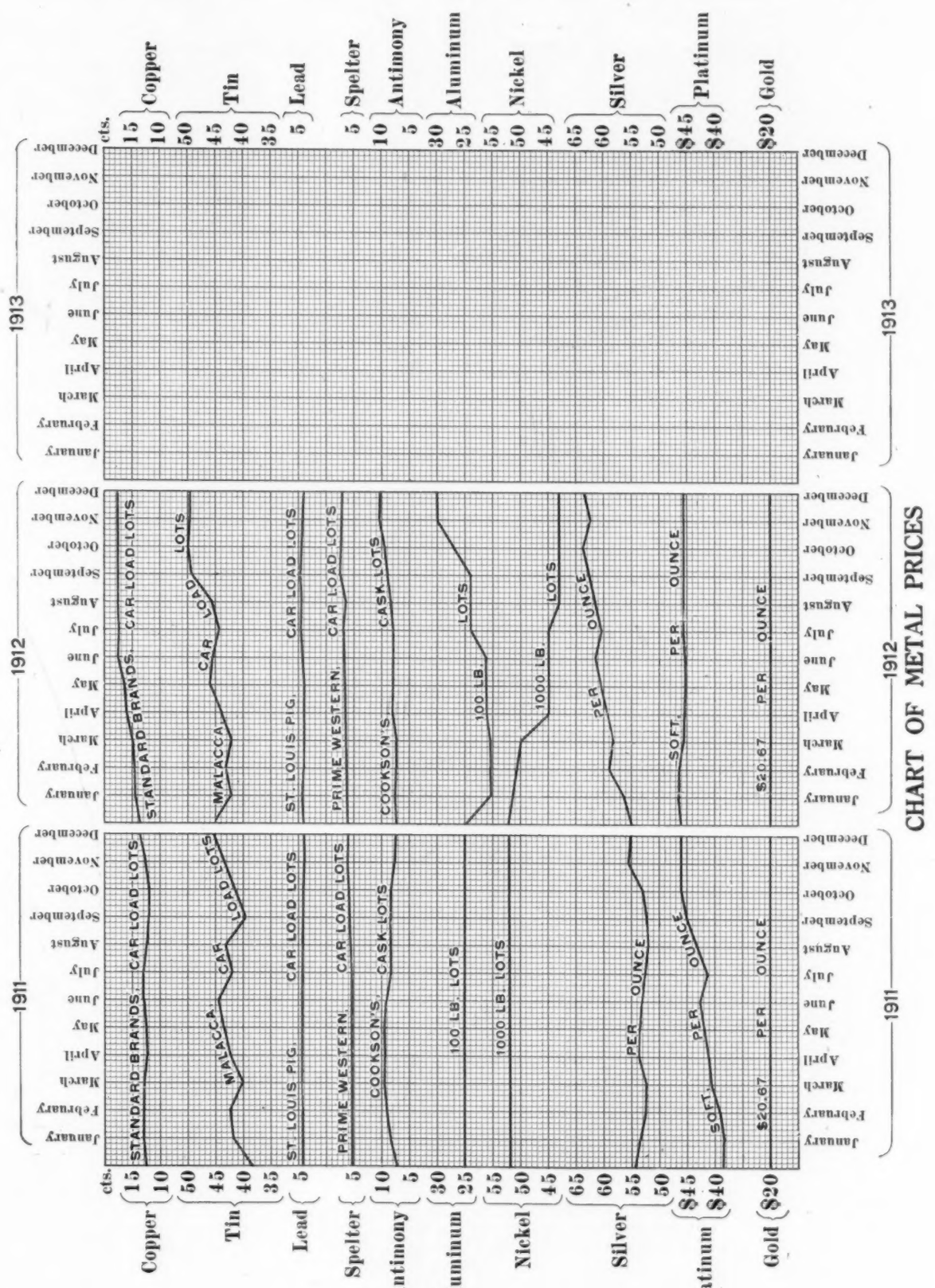


CHART OF METAL PRICES

Pig Iron and Metal Products of the United States

Calendar Years 1903-1911. (1912 Estimated.)

(FROM THE UNITED STATES GEOLOGICAL SURVEY.)

PRODUCTS. METALLIC.	1903. Quantity.	1903. Value.	1904. Quantity.	1904. Value.	1905. Quantity.	1905. Value.	Products.
Pig iron (spot value) long tons	18,009,252	$344,350,000	16,497,033	$233,025,000	22,992,380	$382,450,000	Pig iron.
Silver, commercial value, troy ounces	54,300,000	29,322,000	57,682,800	33,456,000	56,101,600	34,221,976	Silver.
Gold, coining value, troy ounces	3,560,000	73,591,700	3,892,480	80,464,700	4,265,742	88,180,700	Gold.
Copper, value at New York City, pounds	698,044,517	91,506,006	812,537,267	105,629,845	901,907,843	139,795,716	Copper.
Lead, value at New York City, short tons	282,000	23,520,000	307,000	26,402,000	302,000	28,690,000	Lead.
Zinc, value at New York City, short tons	159,219	16,717,995	186,702	18,670,200	203,849	24,054,182	Zinc.
Quicksilver, value at S. Francisco, flasks	35,620	1,544,934	34,570	1,503,795	30,451	1,103,120	Q'ksilver.
Aluminum, value at Pittsburgh, pounds	7,500,000	2,284,900	8,600,000	2,477,000	11,347,000	3,246,300	Aluminum.
Antimony, value at S. F'cisco, short tons	3,128	548,433	3,057	505,524	3,240	705,787	Antimony.
Nickel, value at Philadelphia, pounds	114,200	45,900	24,000	11,400	.....	.....	Nickel.
Tin, pounds	.....	.....	.....	.....	.....	.....	Tin.
Platinum, value (crude) at New York City, troy ounces	110	2,080	200	4,160	318	5,320	Platinum.
Total value of metallic products	.....	$583,433,948	.....	$502,149,624	.....	$702,453,101	

PRODUCTS. METALLIC.	1906. Quantity.	1906. Value.	1907. Quantity.	1907. Value.	1908. Quantity.	1908. Value.	Products.
Pig iron (spot value) long tons	25,307,191	$505,700,000	25,781,361	$529,958,000	15,936,018	$254,321,000	Pig iron.
Silver, commercial value, troy ounces	56,517,900	38,256,400	56,514,400	37,299,700	52,440,800	28,050,600	Silver.
Gold coining value, troy ounces	4,565,333	94,373,800	4,374,827	90,435,700	4,574,340	94,560,000	Gold.
Copper, value at New York City, pounds	917,805,682	177,595,888	868,996,491	173,799,300	942,570,721	124,419,335	Copper.
Lead, value at New York City, short tons	350,153	39,917,442	365,166	38,707,596	310,762	26,104,008	Lead.
Zinc, value at New York City, short tons	199,694	24,362,668	223,745	26,401,910	190,749	17,930,406	Zinc.
Quicksilver, value at S. Francisco flasks	26,238	958,634	21,567	828,931	19,752	824,146	Q'ksilver.
Aluminum, value at Pittsburgh, pounds	14,910,000	4,262,286	17,211,039	4,926,948	11,152,000	2,434,600	Aluminum.
Antimony, value at S. F'cisco, short tons	1,766	602,949	2,022	622,046	13,629	1,264,771	Antimony.
Nickel, value at Philadelphia, pounds	.....	.....	9,910	1,322,985	.....	.....	Nickel.
Tin, pounds	.....	35,600	.....	33,285	.....	.....	Tin.
Platinum, value (crude) at New York City, troy ounces	1,439	45,189	357	10,589	750	14,250	Platinum.
Total value of metallic products	.....	$886,110,856	.....	$903,802,244	.....	$549,923,116	

PRODUCTS. METALLIC.	1909. Quantity.	1909. Value.	1910. Quantity.	1910. Value.	1911. Quantity.	1911. Value.	Products.
Pig iron (spot value) long tons	25,711,846	$437,101,382	26,691,980	$412,162,486	22,303,558	$313,334,936	Pig iron.
Silver, commercial value, troy ounces	54,721,500	28,455,200	57,137,900	30,854,500	60,399,400	32,615,700	Silver.
Gold, coining value, troy ounces	4,821,701	99,673,400	4,657,018	96,269,100	4,687,053	96,890,000	Gold.
Copper, value at New York City, pounds	1,092,951,624	142,083,711	1,080,159,509	137,180,257	1,197,270,000	137,154,092	Copper.
Lead, value at New York City, short tons	444,363	38,215,000	372,227	32,755,976	486,148	36,553,320	Lead.
Zinc, value at New York City, short tons	268,215	28,967,220	252,479	27,267,732	286,621	32,964,794	Zinc.
Quicksilver, value at S. Francisco, flasks	21,075	943,022	20,601	958,153	21,256	977,989	Q'ksilver.
Aluminum, value at Pittsburgh, pounds.	15,000,000	3,750,000	(h)47,734,000	8,955,700	(h)46,126,000	11,531,000	Aluminum.
Antimonial lead, short tons	12,860	1,231,019	14,069	1,338,090	14,078	1,380,556	Antim. l'd.
Nickel, value at Philadelphia, pounds	19,284,172	10,027,769	25,359,544	13,186,963	29,545,967	15,363,903	Nickel.
Tin, pounds	.....	4,832	.....	23,447	130,000	56,636	Tin.
Platinum, value (crude) at New York City, troy ounces	638	15,950	773	25,277	940	40,890	Platinum.
Total value of metallic products	.....	$799,216,654	.....	$748,690,716	.....	$678,863,816	

1912 (ESTIMATED).

PRODUCTS. METALLIC.	Quantity.	Value. Total.	Value. Per Unit.
*Pig iron, long tons	29,647,274	$471,391,657	$15.90
†Copper, pounds	1,560,000,000	250,520,000	.167
†Gold, ounces fine	4,533,496	91,685,168	20.67
†Lead, short tons	480,965	42,998,271	89.40
†Quicksilver, flasks	25,147	1,057,180	42.04
†Silver, ounces fine	62,369,974	37,982,414	.62½
†Zinc, short tons	347,922	38,410,589	110.40
*Nickel (a) pounds	33,311,233	15,156,611	.45½

(a) Smelted in the United States for metal, oxide and salts.
(b) Production from ores originating in the United States.
Figures for metals marked * from Engineering and Mining Journal.
Figures for metal marked † from United States Geological Survey.
(h) Consumption, 1910, 1911.

Metal Prices, January 13, 1913

NEW METALS.	Price per lb. Cents.
COPPER—PIG AND INGOT AND OLD COPPER. Duty Free, Manufactured 2½c. per lb.	
Lake, carload lots	17.75
Electrolytic, carload lots	17.65
Casting, carload lots	17.50
TIN—Duty Free.	
Straits of Malacca, carload lots	50.25
LEAD—Duty Pig, Bars and Old, 2½c. per lb.; pipe and sheets, 2⅜c. per lb.	
Pig lead, carload lots	4.50
SPELTER—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western, carload lots	7.35
ALUMINUM—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. per lb.	
Small lots	33.00
100 lb. lots	30.00
Ton lots	27.00
ANTIMONY—Duty 1½c. per lb.	
Cookson's cask lots, nominal	10.00
Hallett's cask lots	9.50
Hungarian grade	9.25
NICKEL—Duty Ingot, 6c. per lb. Sheet, strip and wire 35 per cent. ad valorem.	
Shot, Plaquettes, Ingots. Blocks according to quantity	.40 to .45
ELECTROLYTIC—3 cents per pound extra.	
MANGANESE METAL—Duty 20 per cent.	.90
MAGNESIUM METAL—Duty 3 cents per pound and 25 per cent. ad valorem (100 lb. lots)	1.50
BISMUTH—Duty free	2.10
CADMIUM—Duty free	.90
CHROMIUM METAL—Duty 25 per cent. ad valorem	.98
QUICKSILVER—Duty 7c. per lb.	.58
	Price per oz.
GOLD—Duty free	$20.67
PLATINUM—Duty free	45.50
SILVER—Government Assay Bars—Duty free	66⅝

INGOT METALS.	Price per lb. Cents.
Silicon Copper, 10%.....according to quantity	27 to 32
Silicon Copper, 20%..... " "	34 to 36
Silicon Copper, 30% guaranteed " "	36 to 38
Phosphor Copper, guaranteed 10% ..... " "	25 to 28
Phosphor Copper, guaranteed 15% ..... " "	24 to 28
Manganese Copper, 25%..... " "	27 to 30
Phosphor Tin, guaranteed 5%.. " "	60 to 63
Phosphor Tin, no guarantee.... " "	55 to 57
Brass Ingot, Yellow..... " "	11⅞ to 12⅞
Brass Ingot, Red ..... " "	14 to 16
Bronze Ingot ..... " "	15⅜ to 15¾
Manganese Bronze ..... " "	19½ to 21
Phosphor Bronze ..... " "	13 to 16
Casting Aluminum Alloys..... " "	25 to 27

PHOSPHORUS—Duty 18c. per lb. According to quantity	30 to 35

Dealers' Buying Prices. Cents per lb.	OLD METALS.	Dealers' Selling Prices. Cents per lb.
15.50 to 16.00	Heavy Cut Copper	16.75 to 17.00
15.00 to 15.25	Copper Wire	16.25 to 16.50
13.75 to 14.00	Light Copper	14.75 to 15.00
12.50 to 12.75	Heavy Mach. Comp.	14.00 to 14.50
9.25 to 9.50	Heavy Brass	10.50 to 10.75
7.50 to 7.75	Light Brass	8.75 to 9.00
9.00 to 9.25	No. 1 Yellow Brass Turnings	10.00 to 10.25
10.75 to 11.25	No. 1 Comp. Turnings	12.00 to 12.50
3.75 to ——	Heavy Lead	—— to 4.00
5.50 to ——	Zinc Scrap	—— to 6.00
10.00 to 12.00	Scrap Aluminum, turnings	13.00 to 15.00
15.00 to 19.00	Scrap Aluminum, cast, alloyed	18.00 to 22.00
20.00 to 22.00	Scrap Aluminum, sheet (new)	23.00 to 25.00
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
20.00 to 23.00	Old Nickel	23.00 to 26.00

PRICES OF SHEET COPPER.

BASE PRICE, 23 Cents per Lb. Net.

PRICES MENTIONED BELOW ARE FOR QUANTITIES OF 100 LBS. AND OVER.

SIZE OF SHEETS.		64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
Width.	LENGTH.	Extras in Cents per Pound for Sizes and Weights Other than Base.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 ins.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 ins.	4	6							

The longest dimension in any sheet shall be considered at its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from ..... 3c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from ..... 5c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices ..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices ..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper ..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper ..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for **Circles and Segments** to be charged on the full size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper ..... 1c.

ZINC—Duty, sheet, 1⅝c. per lb.	Cents per lb.
Carload lots, standard sizes and gauges, at mill	9 less 8%
Casks, jobbers' prices	9½
Open casks, jobbers' prices	10

Metal Prices, January 13, 1913

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect January 1, 1913, and until further notice.

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.17⅛	$0.19¼	$0.20⅞
Wire	.16⅞	.19¼	.20⅞
Rod	.16⅞	.20	.21⅞
Brazed tubing	.21¾	—	.25⅝
Open seam tubing	.20⅝	—	.23⅝
Angles and channels, plain	.21	—	.24⅛

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 9.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass	½c.	per lb. net advance
" —Best spring, drawing and spinning brass	1½c.	" " " "
Wire —Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

To customers who buy 5,000 lbs. or less per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.18⅝	$0.20½	$0.22⅛
Wire	.18⅛	.20½	.22⅛
Rod	.18⅛	.21⅛	.23⅛
Brazed tubing	.23	—	.26⅞
Open seam tubing	.21⅞	—	.24⅞
Angles and channels, plain	.22¼	—	.25⅜

Net extras as shown in American Brass Manufacturers' Price List No. 9.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass	½c.	per lb. net advance
" —Best spring, drawing and spinning brass	1½c.	" " " "
Wire —Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

BARE COPPER WIRE—CARLOAD LOTS.

19c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	24c.	per lb. base
100 lbs. to 300 lbs. in one order	24½c.	" " "
Less than 100 lbs. in one order	26c.	" " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, 22c. per lb.
Seamless Copper Tubing, 26c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	30	29	24	23	22	22	22	22	22	22	22	23	24	26	28	29

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet Brass.	Bronze.
⅝ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1¼ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	69

Discount 45 and 5%.

PRICE FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Red	19c.	net base
Muntz or Yellow Metal Sheathing (14" x 48")	17½c.	" "
" " " Rectangular sheets other than Sheathing	20c.	" "
" " " Rod	17½c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 27⅝c. net.
German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.
Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 28 B. S. Gauge, 2c. above price of pig tin in same quantity.
Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

	Wider than..... 3in.	6in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.
	and including..... 12in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.	40in.
	in coils.								
No. 13 and heavier	34	34	36	36	36	36	39	39	39
" 14	34	34	36	36	36	36	39	39	39
" 15	34	34	36	36	36	36	39	39	39
" 16	34	34	36	36	36	36	39	39	39
" 17	34	34	36	36	36	36	39	39	39
" 18	34	34	36	36	36	36	39	39	42
" 19	34	34	36	36	36	36	39	40	43
" 20	34	36	36	36	36	38	41	42	44
" 21	34	38	38	38	38	40	43	44	50
" 22	34	38	38	38	40	40	43	47	51
" 23	34	38	38	38	40	40	43	49	52
" 24	34	38	40	42	42	42	45	51	54
" 25	36	39	41	43	43	43	46	53	57
" 26	36	39	42	46	46	46	51	55	61
" 27	36	40	44	48	48	49	54	58	64
" 28	36	40	46	48	49	49	56	62	67
" 29	38	41	48	50	52	52	61	67	72
" 30	38	42	50	52	56	62	69	72	77
" 31	43	47	55	58	63	71	74	77	83
" 32	45	49	57	61	69	77	91	90	95
" 33	47	51	60	65	73	84	91	100	110
" 34	50	55	62	70	78	91	103	110	120
" 35	..	65	70	80	90	100	115	125	..
" 36	..	80	90	100	115	120	135	..	..
" 37	..	104	114	129	144	159	174	..	..
" 38	..	124	139	154	169	184	204	..	..
" 39	..	144	164	184	204	224	..	..	..
" 40	..	174	204	224	244	..	..	..	..

In flat rolled sheets the above prices refer to lengths between 2 and 3 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are 100 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 25 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	27	24	..	..	14	20	10	9	16	23
12.	.109.	..	..	..	..	..	..	..	26	..	..	..	15	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	17	..	..	..	..	..
16.	.065.	..	..	..	..	..	28	27	27	24	23	21	21	21	21	27	31	57
18.	.049.	..	..	..	..	33	30	29	28	25	26	26	26	..	..	..	..	..
20.	.035.	117	..	46	39	34	33	32	30	29	30	30	30	31	38	49	58	81
21.	.032.	..	..	..	40	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	138	98	48	42	38	37	35	34	..	..	45	..	..	..	..	..	..
24.	.022.	188	133	108	88	79	73	62	60	66	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter, B. & S. G'ge	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb.	32	32½	32½	33	33½	34	34½	35	36	37	38	43	46

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4 per cent.	to No. 19, B. & S. Gauge, inclusive			$0.60
6 "	" 19, " " "			.70
9 "	" 19, " " "			.85
12 "	" 19, " " "			1.00
15 "	" 19, " " "			1.15
16 "	" 19, " " "			1.20
18 "	" 19, " " "			1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.
For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 2c. below to 6c. above the price of bullion.
Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.